

IoT Home Automation Projects

1. Forget Me Not Design Challenge: Here is the project that uses IOT to make you remember some things at home. This system automatically switches off all the devices using a single button. Monitors room temperature and ensures all doors are closed. It also feeds the cats and monitors it.
2. Automatic Smart Parking System using Internet of Things (IOT): Here an automatic parking system was developed. This system finds the nearest parking area and also provides parking slot in the given area. Thus it reduces the time in finding parking area and also fuel consumption of the vehicle.
3. IOT Based Raspberry Pi Home Automation Using IBM Bluemix: This project shows the home automation using IBM's Bluemix package. One can control the home appliances from anywhere in the world.
4. IoT Home Security Model: This home security system continuously monitors the activities in the home and if there is any harmful activity it is intimated to the owner. The data is stored in the cloud.
5. IoT DoorBell: This project shows an automatic door bell which sends an sms or email. Thus the owner can easily monitor from anywhere if someone knock his door.
6. Home Automation Using Internet of Things: Internet of Things (IoT) allows us to implement home automation system that can be controlled remotely through internet. The proposed system can monitor different parameters like gas, light, motion detection, temperature, etc. using the sensor data and also trigger a process according to the requirement. The data from the sensors are uploaded to a cloud server and this data can be used to analyze the parameters.
7. Smart e-Health Gateway: Bringing Intelligence to Internet-of-Things Based Ubiquitous Healthcare Systems: The paper focus on the fields of IoT and health care systems. A smart e-Health gateway is proposed here which acts as a bridge for medical sensors and hospital automation systems to internet and cloud computing platforms. Such gateways can be used in energy efficiency, reliability and interoperability of the health care systems.
8. Internet of Things: Ubiquitous Home Control and Monitoring System using Android based Smart Phone: Smart homes or home

automation is one of the main applications of IoT and a low cost home monitor and control system is presented in this paper. The system has an embedded web server with internet connectivity. An Android application can be used to remotely control the appliances over the internet. Either mobile networks like 3G/4G or internet using Wi-Fi can be used.

9. Internet of Things Based Architecture of Web and Smart Home Interface Using GSM: The smart home system uses GSM and internet for controlling the home appliances. It can be monitored from anywhere in world. Commands from the web server are converted into GSM commands and sent to the receiver. This controls the appliances

IoT Projects with Raspberry Pi

1. Exploring IOT Application Using Raspberry Pi: This project shows the functioning of raspberry pi as server. Several computers are connected to it and files are accessed and deleted over the network. These are accessed through password to provide security.
2. Raspberry Pi as Internet of Things hardware: Performances and Constraints: This paper compares the key elements, performance of present existing IOT platforms with raspberry pi. It shows that raspberry pi is the best with some disadvantages.
3. IoT Based Biometrics Implementation on Raspberry Pi: Here a low cost IOT based biometric system was built. The application of raspberry pi and cloud computing lead to new way in the research of IOT.
4. Review on Temperature & Humidity Sensing using IoT: Here is the temperature and humidity sensing using IOT. This is a novel method using raspberry pi scripting.
5. Raspberry pi Based Smart Supervisor using Internet of Things (IoT): The smart supervisor system consists of a USB camera, it is encoded on arm-Linux platform, then it is transmitted, and is decoded and displayed as H.264 video.
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| <p>7. Pi Zero IOT Led Matrix Beamer: IOT LED matrix beamer displays the messages and pictures on wall from the internet. It uses raspberry pi0 board, Lamp, OGT cable.</p> |
| <p>8. IoT Temperature Sensor with Raspberry Pi 2 and Thermistor: This project shows the temperature monitoring with raspberry pi. A thermistor is used for monitoring the temperature.</p> |
| <p>9. Motion Controlled Servos using IoT: Real time data streaming using IoT is demonstrated in this project. A Raspberry Pi based motion control of servo motors with live data streaming over the internet is implemented. Leap Motion controller is used for motion tracking and PubNub library is used for data streaming. Four servos and two 8x8 RGB LED matrices are used for detecting motion of the hands and displaying colors according to the spacing between fingers.</p> |
| <p>10. IoT based Stepper Motor Control with Raspberry Pi: The combination of Raspberry Pi and IoT is an exciting one. Raspberry Pi has many general purpose I/O pins and has the ability to control different actuators like stepper motors. In this project, an internet control of stepper motor using Raspberry Pi computer is developed. The connectivity is divided into server side software and client side software.</p> |
| <p>11. IoT Weather Station: A Raspberry Pi and Arduino based IoT weather station is designed in this project. Raspberry Pi provides the necessary network or internet connections while Arduino is associated with the sensors like temperature. The data from the sensor is collected by the Raspberry Pi and is uploaded to a cloud server via SAMI API. The collected data can be monitored and analyzed remotely.</p> |
| <p>12. Home Automation using Raspberry Pi 2 and Windows 10 IoT: This project utilises raspberry pi and arduino for home automation using IOT.</p> |
| <p>13. Multi Room Music Player: An IoT based multi room audio or music streaming system is explained here. A multi room audio system can be used to listen to music in every room of the house. The system uses a Raspberry Pi as the main controller with IR control and relay board for enabling or disabling speakers in specific room. Can be used with Ethernet or Wi-Fi and has the ability to play audio from PC, iPhone or online.</p> |
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of the system mentioned here is to detect electricity theft. It also monitors the energy usage and intimates the customer. A Raspberry Pi based system is used with Wi-Fi connectivity as it implements the IoT network. Any discrepancies in electricity usage, the data is transferred to the remote server over internet.

IoT Projects Using Arduino

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2. Smoking Meat with the Internet of Things: This project shows the internal grill monitoring and is monitored over the internet. Arduino plays a key role in this project.
3. Internet of Things with Android and Arduino: Control remote Led: This project shows the intergration of arduino with Android using IOT.
4. Build a cloud-ready temperature sensor with the Arduino Uno and the IBM Watson IoT Platform: This project shows the building of a temperature sensor. It uses arduino and lot platform developed by the IBM.
5. An IoT Temperature Monitor for Balcony Garden: An Arduino based garden temperature monitoring system is designed here. The system uses a Wi-Fi module to make it an Internet of Things (IoT) device. The system continuously monitors the temperature and posts the readings on the web. The device runs on a battery and in order to save the battery, the readings are taken every 10 minutes and the Arduino goes to sleep.

Wireless / GSM Based IoT Projects

1. A Simple IoT Project with the ESP8266 WiFi module: Here is a simple project with ESP8266 wifi module. This project collects the temperature and is displayed on the network.
2. IoT Candle: This project shows a beautiful candle using Wifi Module and RGB light .

3. IoT Smart Bulb: A RGB bulb that monitors the can be that can be enabled using a wifi module is explained in this project.
4. AWS IoT Remote Soil Moisture Monitor: A soil moisture monitoring system using IOT is proposed here.A ESP8266 Wifi module was used here to connect the system to the internet. Thus the state of the soil moisture can be measured from anywhere in the world.
5. Smart Security Solutions based on Internet of Things (IoT): The proposed system uses RFID or biometric technology for access control system.This is a wireless system.Inputs from the user are processed inside the controller and if they are valid access is given and the details of the user are transferred to the PC using Wi-Fi module.
6. A Design of the IOT Gateway for Agricultural Greenhouse: In this project a green house monitoring and control system was proposed.lot acts as a gate way for public network and wireless network.
7. Design and Control of Internet of Things Enabled Wireless Sensor Network: The paper proposes an IoT based monitoring and control of domestic conditions like temperature, humidity, pressure, current etc. with the help of a low cost wireless sensor network. The system continuously monitors and measures the parameters using sensors and transmits the data over internet. A remote mobile based application can access the data and control the devices.
8. Multidisciplinary Model for Smart Agriculture using Internet of Things: The agriculture industry in developing nations still needs to be modernized and can be done by implementing latest technologies for better production, cost efficiency and distribution. In this article, the concepts of IoT, wireless sensor network, cloud and mobile computing and big data analysis are integrated to develop a smart agriculture system. Different entities like soil health, fertilizers, weather etc. are informed to the farmers.
9. An Internet of Things Approach for Managing Smart Services Provided by Wearable Devices: A wireless sensor network based autonomous physical condition performance system is presented which includes several elements of the IoT like smart phones, watches and physiological monitoring devices. Bluetooth and wireless sensor network enable the integration of the wearable devices and the smart devices. The system collects the data from the physiological devices via Bluetooth and suggests a series of physical activity to improve fitness.

10. Internet of Things based Controlling of Appliances using GSM/GPRS Enabled Embedded Server for Remote Access: The aim of this paper is to implement a smart way to control home appliances using IoT and GSM or GPRS. IoT is the brain of the system as an IoT agent transmits the data to the GSM module after receiving the appropriate data from the user over the internet. The communication to the GSM module is via SMS commands and can be replaced by GPRS technology.

11. Internet of Things Based Architecture of Web and Smart Home Interface Using GSM: The smart home system uses GSM and internet for controlling the home appliances. It can be monitored from anywhere in world. Commands from the web server are converted into GSM commands and sent to the receiver. This controls the appliances.

12. Internet of Things Based Architecture of Web and Smart Home Interface Using GSM: A prototype of smart home controlling system based on IoT and GSM technologies is presented here. In this system, a remote web server is used to monitor and control household devices using internet and GSM-SMS technologies. The user commands from the web are interpreted by the IoT agent and are converted into GSM-SMS commands. The microcontroller decodes the SMS commands and communicates with the respective device.

13. Secured Smart Healthcare Monitoring System Based on IoT: A PIC microcontroller based smart and secured health monitoring system is developed using the concept of IoT. The microcontroller acts as a gateway to the sensors like temperature, pulse, etc. by collecting the data from them and transferring it to a server through internet. The data is accessible by the doctor and during extreme conditions, a warning message is sent to the doctor via GSM module.

14. Intelligent Traffic Information System Based on Internet of Things: A real time traffic information collection and monitoring system for improved road transportation is proposed here. The architecture of the system employs Internet of Things (IoT), Wireless Sensor Network (WSN), RFID, GPS, cloud computing etc. The proposed system is based on IoT and the data collected from large number of sensors and RFIDs is transmitted wirelessly. IoT helps in improving traffic conditions, safety, efficiency and cost of implementation.

15. Internet of Things Based Smart Transportation Systems: The concepts of Wireless Sensor Network (WSN) and Internet of Things (IoT) is used in the proposed system to implement a smart transport system. One of the best applications of the proposed system is in car parking management. RFID, parking sensors, parking meter, road sensors etc. all communicate over the internet and resolve in finding a parking spot and issuing tickets. The system can also be extended to traffic monitoring as well.

16. Internet Of Things (IoT) and Cloud Computing for Agriculture: The technologies of IoT and Cloud computing are integrated for the agriculture sector. Along with the above mentioned technologies, other technologies like wireless sensor network, RFID, geomatics like GPS etc. are used to develop a wisdom based system. With the help of this system, farmers will be able to distribute their products to a wider area of customers. The supply chain management will be controlled by the farmers and corporate sector can provide assistance via cloud computing.

17. Sensor Technologies using ZigBee and RFID within the Cloud of Internet of Things in Healthcare Applications: A cloud of Internet of Things (CloT) system is proposed where the objects in the network can be identified and located in real time. The emerging technologies like ZigBee, RFID, wireless sensor network and IoT are integrated to provide knowledge management system in hospitals. Each object is associated with ZigBee / RFID tags and the system will collect, manage, process and store data for health care purposes. The system provides a visual interface for different operational decisions.

18. Analysis of RFID Application for U-healthcare System in Internet of Things: Wireless Sensor Nodes like RFID tags, NFC tags and other sensor nodes are the main focus of the IoT. Smart health information system utilizes such sensor nodes as a part of the wireless network in hospital environment. The article focuses on the security and vulnerability of the RFID system when used in an IoT application.

19. Green Campus with the Internet of Things: The concept of Internet of Things or IoT is implemented to construct a green campus environment which helps in saving the energy by managing the heavy power consumption devices like air conditioners and work station computers. RFIDs and ZigBee modules along with temperature sensors act as the wireless sensor network. The

computer's idle time is monitored and based on the temperature, the air conditioners are turned on or off.

20. Wireless Sensor System According to the Concept of IoT -Internet of Things: This system monitors the sensors wirelessly. Sensors state can be monitored from anywhere and at anytime in the world.

IoT Projects Using Microcontroller

1. IoT Incubator for Growing Bacteria: This project monitors the growth of bacteria in this incubator. It is made up of some heating pads, fan, temperature sensors. All these are monitored by the microcontroller.

2. IoT Based Electricity Energy Meter Reading and Disconnection using PLC modem and PIC Microcontroller: A PIC microcontroller based smart electricity energy meter monitoring system is proposed here. An IoT domain is used for the system to monitor the units, temperature and inform the user over the internet. Based on the past usage, the system optimizes the power usage for energy saving. In case of delay in payments, the service provider can remotely disconnect the power supply.

IoT Robot Projects

1. A Space Unrestricted Multi-Robot Combat Internet of Things System: This paper researches about multi robot system cooperation without space restriction using IOT.

2. IoT Dune Buggy – Control it from Anywhere!: This project is an attempt to control the locomotion of a robot using the internet from anywhere. The robot is fixed with IR sensor in order to monitor the obstacles in its path. A temperature sensor to monitor the surrounding temperature and a LDR to monitor the light intensity was used here.

IoT LED Projects

1. IOT Led Matrix: The matrix display shown here can be controlled using a mobile phone. It uses a MINTIA sweet box , IOT LED Matrix, a wifi module, LIPO battery and charger board. A app is created for controlling the this wifi with mobile.
2. Smart transportation system: This project shows the IOT enabled smart transportation system.
3. IoT Garage Door Monitor/Opener with Finger Print Scanner: The garage door opener proposed here can be used to monitor the garage door from any where through the mobile phones or by the led array. It can monitor the status of the door from anywhere and a finger print access is given to it in order to stop unauthorized access.
4. IOT based Radio Telescope: Radio telescope monitors the radio astronomy enviroment and accordingly it is controlled using mobile phones.
5. IoT Enabled Egg Tray: The IOT enabled Egg tray monitors the count of eggs and displays it on the interent. Not only this it remonds the owner when he is near a grosroory shop/mall about the low count.
6. IoT Mbed Smart Alarm Clock: An internet enabled smart alarm clock is developed in this project. The alarm can be set via internet as the clock uses an Mbed web server. It also displays current time, temperature and weather. Further, it can control devices like lights, fan and speakers upon reaching the specified time for alarm.
7. Internet of Things for Smart Cities: The aim of this paper is to analyze the implementations of smart cities using Internet of Things or also called as urban IoTs. The proposed architectures exploits the existing advanced communication systems and implements value added services for the administration of the city and also for individual citizens.
8. A Real IoT Implementation of a Machine-learning Architecture for reducing energy consumption: The aim of the approach is to reduce the ecological impact of replacing the old consumer goods with new internet enabled devices. An electronic adaptor is embedded with the old appliances so that they can be part of the IoT network and avoid replacement. The paper also aims to provide a cloud based application for energy consumption monitoring and methods for optimal efficiency.

IoT Projects Using Android Application

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Sensor Based IoT Projects

1. IoT Home Security Model: The home can be monitored from where through the internet using the sensors connected in the home.
2. IoT Pill Bottle: This project shows the IOT pill bottle. It helps the Patient and the doctor. It monitors the pills bottle using a cap button to detect the time pattern of pill taken and also had IR sensor to detect fill status and refill it.
3. MABO – monitoring system of children in school: This system has a tag with some sensors given to the children in the school. This monitors the location of the children and is noted on the internet.
4. Network Architecture Designed for an Adaptable IoT based Smart Office: With the help of this project, live remote monitoring of vehicle's essential data like temperature, pressure, oil, lights, GPS, etc. is possible by using different sensors. Using the IoT domain, the data from different sensors is collected and information like different ways to reach from A to B, shortest way to save fuel, effective methods for faster and safer driving etc. are displayed.
5. Health Monitoring and Management Using Internet of Things: The concept of remote health monitoring is implemented here with the help of IoT technology. The system integrates the concept of health monitoring and clinical practice. This is possible with the help of latest wearable devices with built-in sensors and also have IoT capability. The data from the sensors is transferred over the internet and can be used to analyze the health of a patient by the physician.

WiFi Based IoT Projects

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RFID Based IoT Projects

1. Secure Smart Environment Using IOT based on RFID: The smart and secure enviroment system can be used in shopping malls.The lot connects everything to the internet.Rfid provides the authentication.The products placed in the shopping cart are autoamticclay deteted and the amount of bill deducted from your account.
2. Smart Trash Can IoT System: This project aims at optimizing the collection of waste and thus reducing the fuel consumption. This system gives the details like amount of stuff inside the container, temperature inside the container. This data is sent over the cellular network and is displayed on the web platform. Drivers are provided with RFID card ,so that the driver who collected the garbage can be noted.
3. Smart Disease Surveillance Based on Internet of Things (IoT): Health monitoring and surveillance allows the Governments of developing nations to interpret the data on disease patterns and necessary actions can be implemented. The concept of Internet of Things (IoT) helps in retrieving information from everyone connected to the internet. An RFID and some sensing devices capture the patients' records and transfer them to the backbone network for further processing.

4. The Application of IoT in Agricultural means of Production Supply Chain Management: In this article, the concept of Internet of Things (IoT) is applied to production supply chain for agricultural products. The applications of IoT to agriculture products supply chain will improve the operation efficiency of low level supply chain, small and medium industrialization, low level management and information exchange. IoT based on RFID is integrated in all aspects of supply chain for better management.
5. Integrating Wireless Sensor Networks into Internet Of Things For Security: IoT includes many objects like RFID tags, sensors, actuators, computers, phones etc. All these devices are assigned with a separate identifier and through unique addressing system, they communicate with each other. The purpose of this paper is to create a secure channel between the sensors and the internet host for enhanced security of the communication.
6. Secure Smart Environment Using IOT based on RFID: An IoT technology based smart environment scheme is mentioned here that is based on RFID system. The system helps in implementing a secure shopping scenario where the goods are associated with an RFID tag and the information is made available to the user through their smart phone. The billing and payment are made easy. The system can be used to track the quantity of the goods and set a reminder.
7. RFID Modular System for the Internet of Things (IoT): The main aim of this paper is to design system architecture for identifying and monitoring movement of monitored items. The basic requirement is to create a modular system and application of this system for real hospital laundry management application

Other IoT Projects

1. Vehicle Simulator – VTR / RTR: This project is an virtual vehicle simulator that can used by anyone.
2. IoT-based Intelligent for Fire Emergency Response Systems: This intelligent fire emergency system directs the evacuees by calculating the time and emergency ,so that it can save many human lives.
3. The constitution of vegetable traceability system in agricultural IOT: In this the constitution of vegetable traceability system in agricultural IOT is introduced. In addition, it discusses the

application in the processes of planting, logistics, consumer. Then some existing problems can be analyzed. Finally, this article forecasts the application of vegetable traceability system in the future.

4. An IoT based reference architecture for smart water management: An intelligent water management system combining bussiness process coordination and decision support.
5. Optic Fiber Sensing IOT Technology and Application Research: This article discusses about the Current status of the IOT. Not only this Optical sensing technology was also discussed.Finally,Optical fiber sensing technology and iot are combined and a specific application is developed.
6. Big Data Summarization Using Semantic Feture for IoT on Cloud: This paper proposes a big data (i.e., documents, texts) summarization method using the extracted semantic feature which it is extracted by distributed parallel processing of NMF based cloud technique of Hadoop.
7. Enabling Smart Cities through a Cognitive Management Framework for the Internet of Things: The proposed framework solves the the issues that prevent IOT from Supporting development of smart cities.
8. Getting Lost in the Internet of Things: How to Build a Personal Locator Beacon: This project shows a personal locator becon using IOT.This is used to locate the area if some one needs help.
9. An Internet of Things Oriented Approach for Water Utility Monitoring and Control: This paper shows the An IOT approach for monitering and controlling of water utility management.
10. IOT Power strip: IOT power Strip, in which one can control four power sockets from the phone.For this project no need of installing IOT server.
11. IOT weather station: This project monitors the weather and diaplays it on the internet .
12. IOT Coffee Maker: A coffe maker using IOT can be operated any where.uisng this one can set brew strength ,time delay,brew status.
13. Project "Gallon" – Smart Drinking Water Monitoring Platform: This project monitors drinking water and analyses it.It can be monitored from anywhere using ITO platform.
14. IoT Water Flow Meter: This project collects the water used in the house or apartment and usage is stored in the database.

<p>15. IoT Chat – Messaging for Devices: IoT chat allows the IOT users to communicate with each other from anywhere in the world.this provides the robust and easy to use platform for IOT user and hackers to support their projects</p>
<p>16. Windows IoT Core Breathalyzer: This project shows a internet based alcohol alyzer with cloud based logging and reporting.An LCD. Used in this project helps the user by giving the instructions.</p>
<p>17. Windows IoT: Facial Recognition Door: A facial recognition system is developed in this project.This system detects the authorized user and unlocks the door.If any unauthorized person enters the door it remains locked ,so that it provides the protection.</p>
<p>18. Jet Engine Monitor with Windows IoT Core and Azure IoT Suite: This project leverages Windows IoT Core and Azure Machine Learning connected to an iot hub with web front-end to monitor and predict the remaining useful life of a jet engine.</p>
<p>19. IoT Alarm Clock: Here is the alarm clock usign IOT.It gives the for the voice message .</p>
<p>20. IoT Motion Controlled Servos: Here is the IOT Project which controls the servos by the different hand gestures.This dipalys different colors depending on the finger position</p>
<p>21. Intel IoT Autonomous Underwater Vehicles: An autonomous under water vehicle was designed here to monitor under water satus of ponds,sea , ocean .</p>
<p>22. DIY – Control Off-road Lego Car Through Internet (IoT) – Part 1 (Back Wheel): Here is a fun project of controlling off road lego thourgh internet.</p>
<p>23. DigiWallet – Your Smart Wallet: Here a smart wallet is proposed in this system.The wallet is paired with the mobile phone and it will sned a notiification if your wallet is out of range.You can locate the wallet by using an app.</p>
<p>24. Build Your Own Hackable, Weight Tracking, Text Messaging Scale with a Sense of Humor</p>
<p>25. Smart Campus: A user-centric testbed for Internet of Things experimentation: The paper presents a smart campus scenario which is testbed for user IoT experimentation. The system employs IoT devices as programmable substrates in office environment and can be experimented with real time end users. The structure provides the realistic end user involvement and also lab based testbeds for experimentation.</p>

IoT Healthcare Projects

1. Intelligent Healthcare Service by using Collaborations between IoT Personal Health Devices: The intelligent health care service system gives the feedback to an individual about their health.
2. Smart plant system: This project shows the plant health status. Environmental parameters like temperature, humidity, light intensity were monitored.
3. Towards an IoT for Healthcare: This project tests the feasibility of using IOT with Biosignal monitoring and shows how it is used at low cost for health care monitoring.
4. E-Health Glove (Intel IoT): The E health glove proposed here monitors the body vitals of the patients and is stored in the server. Although latest ambulances can have body vital measuring equipment, this monitors before the arrival of the ambulance and is informed to doctor for better treatment.
5. A Secure and Efficient Authentication and Authorization Architecture for IoT-Based Healthcare: An IoT based healthcare system is developed using smart gateways with secure and efficient authentication and authorization. The smart e-health gateways perform the tasks of authentication and authorization in place of resource constrained medical sensors. The proposed architecture provides a reliable security for the latest IoT based healthcare systems.

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7. Design and Control of Internet of Things Enabled Wireless Sensor Network: The paper proposes an IoT based monitoring and control of domestic conditions like temperature, humidity, pressure, current etc. with the help of a low cost wireless sensor network. The system continuously monitors and measures the parameters using sensors and transmits the data over internet. A remote mobile based application can access the data and control the devices.
8. Multidisciplinary Model for Smart Agriculture using Internet of Things: The agriculture industry in developing nations still needs to be modernized and can be done by implementing latest technologies for better production, cost efficiency and distribution. In this article, the concepts of IoT, wireless sensor network, cloud and mobile computing and big data analysis are integrated to develop a smart agriculture system. Different entities like soil health, fertilizers, weather etc. are informed to the farmers.
9. An Internet of Things Approach for Managing Smart Services Provided by Wearable Devices: A wireless sensor network based autonomous physical condition performance system is presented which includes several elements of the IoT like smart phones, watches and physiological monitoring devices. Bluetooth and wireless sensor network enable the integration of the wearable devices and the smart devices. The system collects the data from the physiological devices via Bluetooth and suggests a series of physical activity to improve fitness.
10. Internet of Things based Controlling of Appliances using GSM/GPRS Enabled Embedded Server for Remote Access: The aim of this paper is to implement a smart way to control home appliances using IoT and GSM or GPRS. IoT is the brain of the system as an IoT agent transmits the data to the GSM module after receiving the appropriate data from the user over the internet. The communication to the GSM module is via SMS commands and can be replaced by GPRS technology.
11. Internet of Things Based Architecture of Web and Smart Home Interface Using GSM: The smart home system uses GSM and internet for controlling the home appliances. It can be monitored from anywhere in world. Commands from the web server are converted into GSM commands and sent to the receiver. This controls the appliances.
12. Internet of Things Based Architecture of Web and Smart Home Interface Using GSM: A prototype of smart home controlling system based on IoT and GSM technologies is presented here. In this system, a remote web server is used to monitor and control household devices using internet and GSM-SMS technologies. The user commands from the web are interpreted by the IoT agent and are converted into GSM-SMS commands. The microcontroller decodes the SMS commands and communicates with the respective device.
13. Secured Smart Healthcare Monitoring System Based on IoT: A PIC microcontroller based smart and secured health monitoring system is developed using the concept of IoT. The microcontroller acts as a gateway to

the sensors like temperature, pulse, etc. by collecting the data from them and transferring it to a server through internet. The data is accessible by the doctor and during extreme conditions, a warning message is sent to the doctor via GSM module.

14. Intelligent Traffic Information System Based on Internet of Things: A real time traffic information collection and monitoring system for improved road transportation is proposed here. The architecture of the system employs Internet of Things (IoT), Wireless Sensor Network (WSN), RFID, GPS, cloud computing etc. The proposed system is based on IoT and the data collected from large number of sensors and RFIDs is transmitted wirelessly. IoT helps in improving traffic conditions, safety, efficiency and cost of implementation.

15. Internet of Things Based Smart Transportation Systems: The concepts of Wireless Sensor Network (WSN) and Internet of Things (IoT) is used in the proposed system to implement a smart transport system. One of the best applications of the proposed system is in car parking management. RFID, parking sensors, parking meter, road sensors etc. all communicate over the internet and resolve in finding a parking spot and issuing tickets. The system can also be extended to traffic monitoring as well.

16. Internet Of Things (IoT) and Cloud Computing for Agriculture: The technologies of IoT and Cloud computing are integrated for the agriculture sector. Along with the above mentioned technologies, other technologies like wireless sensor network, RFID, geomatics like GPS etc. are used to develop a wisdom based system. With the help of this system, farmers will be able to distribute their products to a wider area of customers. The supply chain management will be controlled by the farmers and corporate sector can provide assistance via cloud computing.

17. Sensor Technologies using ZigBee and RFID within the Cloud of Internet of Things in Healthcare Applications: A cloud of Internet of Things (CloT) system is proposed where the objects in the network can be identified and located in real time. The emerging technologies like ZigBee, RFID, wireless sensor network and IoT are integrated to provide knowledge management system in hospitals. Each object is associated with ZigBee / RFID tags and the system will collect, manage, process and store data for health care purposes. The system provides a visual interface for different operational decisions.

18. Analysis of RFID Application for U-healthcare System in Internet of Things: Wireless Sensor Nodes like RFID tags, NFC tags and other sensor nodes are the main focus of the IoT. Smart health information system utilizes such sensor nodes as a part of the wireless network in hospital environment. The article focuses on the security and vulnerability of the RFID system when used in an IoT application.

19. Green Campus with the Internet of Things: The concept of Internet of Things or IoT is implemented to construct a green campus environment which helps in saving the energy by managing the heavy power consumption devices like air conditioners and work station computers. RFIDs and ZigBee modules along with temperature sensors act as the wireless sensor network. The computer's

idle time is monitored and based on the temperature, the air conditioners are turned on or off.

20. Wireless Sensor System According to the Concept of IoT -Internet of Things: This system monitors the sensors wirelessly. Sensors state can be monitored from anywhere and at anytime in the world.

IoT Projects Using Microcontroller

1. IoT Incubator for Growing Bacteria: This project monitors the growth of bacteria in this incubator. It is made up of some heating pads, fan, temperature sensors. All these are monitored by the microcontroller.
2. IoT Based Electricity Energy Meter Reading and Disconnection using PLC modem and PIC Microcontroller: A PIC microcontroller based smart electricity energy meter monitoring system is proposed here. An IoT domain is used for the system to monitor the units, temperature and inform the user over the internet. Based on the past usage, the system optimizes the power usage for energy saving. In case of delay in payments, the service provider can remotely disconnect the power supply.

IoT Robot Projects

1. A Space Unrestricted Multi-Robot Combat Internet of Things System: This paper researches about multi robot system cooperation without space restriction using IOT.
2. IoT Dune Buggy – Control it from Anywhere!: This project is an attempt to control the locomotion of a robot using the internet from anywhere. The robot is fixed with IR sensor in order to monitor the obstacles in its path. A temperature sensor to monitor the surrounding temperature and a LDR to monitor the light intensity was used here.

IoT LED Projects

1. IOT Led Matrix: The matrix display shown here can be controlled using a mobile phone. It uses a MINTIA sweet box, IOT LED Matrix, a wifi module, LIPO battery and charger board. A app is created for controlling the this wifi with mobile.
2. Smart transportation system: This project shows the IOT enabled smart transportation system.
3. IoT Garage Door Monitor/Opener with Finger Print Scanner: The garage door opener proposed here can be used to monitor the garage door from any where

through the mobile phones or by the led array. It can monitor the status of the door from anywhere and a finger print access is given to it in order to stop unauthorized access.

4. IOT based Radio Telescope: Radio telescope monitors the radio astronomy environment and accordingly it is controlled using mobile phones.
5. IoT Enabled Egg Tray: The IOT enabled Egg tray monitors the count of eggs and displays it on the internet. Not only this it reminds the owner when he is near a grocery shop/mall about the low count.
6. IoT Mbed Smart Alarm Clock: An internet enabled smart alarm clock is developed in this project. The alarm can be set via internet as the clock uses an Mbed web server. It also displays current time, temperature and weather. Further, it can control devices like lights, fan and speakers upon reaching the specified time for alarm.
7. Internet of Things for Smart Cities: The aim of this paper is to analyze the implementations of smart cities using Internet of Things or also called as urban IoTs. The proposed architectures exploits the existing advanced communication systems and implements value added services for the administration of the city and also for individual citizens.
8. A Real IoT Implementation of a Machine-learning Architecture for reducing energy consumption: The aim of the approach is to reduce the ecological impact of replacing the old consumer goods with new internet enabled devices. An electronic adaptor is embedded with the old appliances so that they can be part of the IoT network and avoid replacement. The paper also aims to provide a cloud based application for energy consumption monitoring and methods for optimal efficiency.

IoT Projects Using Android Application

1. Improved Particle Swarm Optimization Algorithm for Android Medical Care IOT using Modified Parameters

Sensor Based IoT Projects

1. IoT Home Security Model: The home can be monitored from where through the internet using the sensors connected in the home.
2. IoT Pill Bottle: This project shows the IOT pill bottle. It helps the Patient and the doctor. It monitors the pills bottle using a cap button to detect the time pattern of pill taken and also had IR sensor to detect fill status and refill it.
3. MABO – monitoring system of children in school: This system has a tag with some sensors given to the children in the school. This monitors the location of the children and is noted on the internet.

4. Network Architecture Designed for an Adaptable IoT based Smart Office: With the help of this project, live remote monitoring of vehicle's essential data like temperature, pressure, oil, lights, GPS, etc. is possible by using different sensors. Using the IoT domain, the data from different sensors is collected and information like different ways to reach from A to B, shortest way to save fuel, effective methods for faster and safer driving etc. are displayed.
5. Health Monitoring and Management Using Internet of Things: The concept of remote health monitoring is implemented here with the help of IoT technology. The system integrates the concept of health monitoring and clinical practice. This is possible with the help of latest wearable devices with built in sensors and also have IoT capability. The data from the sensors is transferred over the internet and can be used to analyze the health of a patient by the physician.

WiFi Based IoT Projects

1. A Simple IoT Project with the ESP8266 WiFi module: Here is a simple project with ESP8266 wifi module. This project collects the temperature and is displayed on the network.
2. IoT Candle: This project shows a beautiful candle using Wifi Module and RGB light .
3. IoT Smart Bulb: A RGB bulb that monitors the can be that can be enabled using a wifi module is explained in this project.
4. AWS IoT Remote Soil Moisture Monitor: A soil moisture monitoring system using IOT is proposed here. A ESP8266 Wifi module was used here to connect the system to the internet. Thus the state of the soil moisture can be measured from anywhere in the world.
5. Smart Security Solutions based on Internet of Things (IoT): The proposed system uses RFID or biometric technology for access control system. This is a wireless system. Inputs from the user are processed inside the controller and if they are valid access is given and the details of the user are transferred to the PC using Wi-Fi module.

RFID Based IoT Projects

1. Secure Smart Environment Using IOT based on RFID: The smart and secure environment system can be used in shopping malls. The IoT connects everything to the internet. RFID provides the authentication. The products placed in the shopping cart are automatically detected and the amount of bill deducted from your account.
2. Smart Trash Can IoT System: This project aims at optimizing the collection of waste and thus reducing the fuel consumption. This system gives the details like amount of stuff inside the container, temperature inside the container. This

data is sent over the cellular network and is displayed on the web platform. Drivers are provided with RFID card ,so that the driver who collected the garbage can be noted.

3. Smart Disease Surveillance Based on Internet of Things (IoT): Health monitoring and surveillance allows the Governments of developing nations to interpret the data on disease patterns and necessary actions can be implemented. The concept of Internet of Things (IoT) helps in retrieving information from everyone connected to the internet. An RFID and some sensing devices capture the patients' records and transfer them to the backbone network for further processing.
4. The Application of IoT in Agricultural means of Production Supply Chain Management: In this article, the concept of Internet of Things (IoT) is applied to production supply chain for agricultural products. The applications of IoT to agriculture products supply chain will improve the operation efficiency of low level supply chain, small and medium industrialization, low level management and information exchange. IoT based on RFID is integrated in all aspects of supply chain for better management.
5. Integrating Wireless Sensor Networks into Internet Of Things For Security: IoT includes many objects like RFID tags, sensors, actuators, computers, phones etc. All these devices are assigned with a separate identifier and through unique addressing system, they communicate with each other. The purpose of this paper is to create a secure channel between the sensors and the internet host for enhanced security of the communication.
6. Secure Smart Environment Using IOT based on RFID: An IoT technology based smart environment scheme is mentioned here that is based on RFID system. The system helps in implementing a secure shopping scenario where the goods are associated with an RFID tag and the information is made available to the user through their smart phone. The billing and payment are made easy. The system can be used to track the quantity of the goods and set a reminder.
7. RFID Modular System for the Internet of Things (IoT): Themain aim of this paper is to design system architecture for identifying and monitoring movement of monitored items. The basic requirement is to create a modular system and application of this system for real hospital laundry management application

Other IoT Projects

1. Vehicle Simulator – VTR / RTR: This project is an virtual vehicle simulator that can used by anyone.
2. IoT-based Intelligent for Fire Emergency Response Systems: This intelligent fire emrgency system directs the evacuees by calculating the time and emergency ,so that it can save many human lives.

3. The constitution of vegetable traceability system in agricultural IOT: In this the constitution of vegetable traceability system in agricultural IOT is introduced. In addition, it discusses the application in the processes of planting, logistics, consumer. Then some existing problems can be analyzed. Finally, this article forecasts the application of vegetable traceability system in the future.
4. An IoT based reference architecture for smart water management: An intelligent water management system combining bussiness process coordination and decision support.
5. Optic Fiber Sensing IOT Technology and Application Research: This article discusses about the Current status of the IOT. Not only this Optical sensing technology was also discussed.Finally,Optical fiber sensing technology and iot are combined and a specific application is developed.
6. Big Data Summarization Using Semantic Feture for IoT on Cloud: This paper proposes a big data (i.e., documents, texts) summarization method using the extracted semantic feature which it is extracted by distributed parallel processing of NMF based cloud technique of Hadoop.
7. Enabling Smart Cities through a Cognitive Management Framework for the Internet of Things: The proposed framework solves the the issues that prevent IOT from Supporting development of smart cities.
8. Getting Lost in the Internet of Things: How to Build a Personal Locator Beacon: This project shows a personal locator becon using IOT.This is used to locate the area if some one needs help.
9. An Internet of Things Oriented Approach for Water Utility Monitoring and Control: This paper shows the An IOT approach for monitering and controlling of water utility management.
10.IOT Power strip: IOT power Strip, in which one can control four power sockets from the phone.For this project no need of installing IOT server.
11.IOT weather station: This project monitors the weather and diaplays it on the internet .
12.IOT Coffee Maker: A coffe maker using IOT can be operated any where.uisng this one can set brew strength ,time delay,brew status.
13.Project "Gallon" – Smart Drinking Water Monitoring Platform: This project monitors drinking water and analyses it.It can be monitored from anywhere using ITO platform.
14.IoT Water Flow Meter: This project collects the water used in the house or apartment and usage is stored in the database.
15. IoT Chat – Messaging for Devices: IoT chat allows the IOT users to communicate with each other from anywhere in the world.this provides the robust and easy to use platform for IOT user and hackers to support their projects
16.Windows IoT Core Breathalyzer: This project shows a internet based alcohol alyzer with cloud based logging and reporting.An LCD. Used in this project helps the user by giving the instructions.
17.Windows IoT: Facial Recognition Door: A facial recognition system is developed in this project.This system detects the authorized user and unlocks

the door.If any unauthorized person enters the door it remains locked ,so that it provides the protection.

18. Jet Engine Monitor with Windows IoT Core and Azure IoT Suite: This project leverages Windows IoT Core and Azure Machine Learning connected to an iot hub with web front-end to monitor and predict the remaining useful life of a jet engine.

19. IoT Alarm Clock: Here is the alarm clock usign IOT.It gives the for the voice message .

20. IoT Motion Controlled Servos: Here is the IOT Project which controls the servos by the different hand gestures.This dipalys different colors depending on the finger position

21. Intel IoT Autonomous Underwater Vehicles: An autonomous under water vehicle was designed here to monitor under water satsus of ponds,sea , ocean .

22. DIY – Control Off-road Lego Car Through Internet (IoT) – Part 1 (Back Wheel): Here is a fun project of controlling off road lego thourgh internet.

23. DigiWallet – Your Smart Wallet: Here a smart wallet is proposed in this system.The wallet is paired with the mobile phone and it will sned a notiification if your wallet is out of range.You can locate the wallet by using an app.

24. Build Your Own Hackable, Weight Tracking, Text Messaging Scale with a Sense of Humor

25. Smart Campus: A user-centric testbed for Internet of Things experimentation: The paper presents a smart campus scenario which is testbed for user IoT experimentation. The system employs IoT devices as programmable substrates in office environment and can be experimented with real time end users. The structure provides the realistic end user involvement and also lab based testbeds for experimentation.

IoT Healthcare Projects

1. Intelligent Healthcare Service by using Collaborations between IoT Personal Health Devices: The intelligent health care service sytem gives the feedback to an individual about their health.

2. Smart plant system: Thi sproject shows the plant health status.Environmental parametrs like temperature,humidity ,light intensity were monitered.

3. Towards an IoT for Healthcare: This projects tests the feasibility of using IOT with Biosignal monitoring and shows how it is used at low cost for health care monitoring.

4. E-Health Glove (Intel IoT): The E health glove proposed here monitors the body vitals of the patients and is stored in the server.Although latest ambulances can have body vital mesuring equipment ,this monitors before the arrival of the ambulance and is informed to doctor for better treatment.

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Mob:9008611118

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5. **A Secure and Efficient Authentication and Authorization Architecture for IoT-Based Healthcare:** An IoT based healthcare system is developed using smart gateways with secure and efficient authentication and authorization. The smart e-health gateways perform the tasks of authentication and authorization in place of resource constrained medical sensors. The proposed architecture provides a reliable security for the latest IOT based healthcare systems.

1. Datacenter at the Airport: Reasoning about Time-Dependent Parking Lot Occupancy

Abstract—Recently, Olariu et al. [3], [7], [18], [19], [20] proposed to refer to a dynamic group of vehicles whose excess computing, sensing, communication, and storage resources can be coordinated and dynamically allocated to authorized users, as a vehicular cloud. One of the characteristics that distinguishes vehicular clouds from conventional clouds is the dynamically changing amount of available resources that, in some cases, may fluctuate rather abruptly. In this work, we envision a vehicular cloud involving cars in the long-term parking lot of a typical international airport. The patrons of such a parking lot are typically on travel for several days, providing a pool of cars that can serve as the basis for a datacenter at the airport. We anticipate a park and plug scenario where the cars that participate in the vehicular cloud are plugged into a standard power outlet and are provided Ethernet connection to a central server at the airport. In order to be able to schedule resources and to assign computational tasks to the various cars in the vehicular cloud, a fundamental prerequisite is to have an accurate picture of the number of vehicles that are expected to be present in the parking lot as a function of time. What makes the problem difficult is the time-varying nature of the arrival and departure rates. In this work, we concern ourselves with predicting the parking occupancy given time-varying arrival and departure rates. Our main contribution is to provide closed forms for the probability distribution of the parking lot occupancy as a function of time, for the expected number of cars in the parking lot and its variance, and for the limiting behavior of these parameters as time increases. In addition to analytical results, we have obtained a series of empirical results that confirm the accuracy of our analytical predictions.

2. Energy-Efficient Dynamic Packet Downloading for Medical IoT Platforms

Abstract—This paper proposes a polynomial-time algorithm for energy-efficient dynamic packet downloading from medical cloud storage to medical internet-of-things (IoT) devices. The medical cloud can distribute its own medical data to medical IoT devices via access points. Therefore, network disconnection can happen between the medical cloud and medical IoT devices when power/energy management in each access point is not efficient. This situation is especially harmful in in-hospital network architectures because the architecture usually has strict requirements

in terms of reliability. Therefore, this paper proposes a dynamic energy-efficient algorithm which computes the amount of power allocation in each access point based on the buffer backlog size and channel states under the consideration of buffer stability. With the proposed adaptive algorithm, each access point calibrates its own parameters for more adaptive power/energy management. The performance of the proposed algorithm is

evaluated in terms of network lifetime; and it is observed that the proposed algorithm achieves desired performance.

3. Face Recognition and Spoofing Detection System Adapted To Visually-Impaired People

Abstract— According to estimates by the World Health Organization, about 285 million people suffer from some kind of

visual disability, of whom 39 million are blind, resulting in 0.7% of the world population. Computer vision techniques and image

analysis can help improve visually-impaired people. In this project, a system that allows for facial recognition and detection

of spoofing adapted to the needs of disabled people is proposed, implemented and validated. The architecture has been carefully

selected and subsequently implemented following an innovative facial normalization algorithm in order to increase both the

recognition rate of facial identification and spoofing detection. The information provided to the user is composed by the name of

the person identified and whether it is real or fake image (photograph). This information is provided by means of a text-to-speech

tool. This architecture can be integrated into video doorphone installations (videointercom installations), devices with

reduced computing capabilities or the users' mobile phones. The architecture has been validated in a real environment with both

real users and printed images achieving very good results.

4. Internet of Things and BOM-Based Life Cycle Assessment of Energy-Saving and

Emission-Reduction of Products

Abstract—Energy-saving and emission-reduction (ESER), carbon footprint, carbon labeling, and carbon trading have attracted

much attention recently due to severe environmental challenges. One key technology for implementing the above concepts is how to realize the effective quantitative evaluation of ESER. In this paper, the existing ESER evaluation technology and systems are summarized first. It is found that the existing ESER evaluation technology and systems are almost isolated from the existing enterprise

information systems, such as enterprise resource planning (ERP), product data management (PDM), and customer relationship management (CRM), which results in the expanding of the enterprise information islands. In order to address this problem, a new method for ESER life cycle assessment (LCA) based on Internet of Things (IoT) and bill of material (BOM) is proposed in this paper. A fourlayered structure (i.e., perception access layer, data layer, service layer, and application layer) ESER LCA system based on IoT and BOM is designed and presented, as well as the key technologies and the functions in each layer. A prototype application system is developed to validate the proposed method. The main contributions of the proposed method are: 1) facilitate real-time intelligent perception, and the collection of energy consumption and environmental

impact data generated in the entire life cycle of manufacturing by using IoT technologies; and 2) realize effective data integration

between the ESER evaluation system and the existing enterprise information systems based on BOM.

5. SDIF: Social Device Interaction Framework for Encounter and Play in Smart Home Service

Abstract — In this paper, a framework for the mutual interaction of smart devices used in a smart home service is

proposed by utilizing the concept of device sociality to minimize human interventions. The framework makes easy

device collaboration possible by providing social relations among devices when they encounter each other. To measure

the effect of the reduction in human intervention during the process of configuring the mutual interactions of such devices,

a zero configuration index of the mutual interaction processes among smart devices was adopted. To show its feasibility in

terms of minimizing human intervention, the proposed method was compared with another traditional device interaction

protocol for a file and screen sharing application between two smart devices¹.

6. Teach Me—Show Me”—End-User Personalization of a Smart Home and Companion Robot

Abstract—Care issues and costs associated with an increasing elderly population are becoming a major concern for many countries. The use of assistive robots in “smart-home” environments has been suggested as a possible partial solution to

these concerns. A challenge is the personalization of the robot to meet the changing needs of the elderly person over time. One approach is to allow the elderly person, or their carers or relatives, to make the robot learn activities in the smart home and teach it to carry out behaviors in response to these activities. The overriding premise being that such teaching is both intuitive and “nontechnical.” To evaluate these issues, a commercially available autonomous robot has been deployed in a fully sensorized but otherwise ordinary suburban house. We describe the design approach to the teaching, learning, robot, and smart home systems as an integrated unit and present results from an evaluation of the teaching component with 20 participants and a preliminary evaluation of the learning component with three participants in a human–robot interaction experiment. Participants reported findings using a system usability scale and ad-hoc Likert questionnaires. Results indicated that participants thought that this approach to robot personalization was easy to use, useful, and that they would be capable of using it in real-life situations both for themselves and for others.

7. Real-Time Patient Health Monitoring and Alarming Using Wireless-Sensor-Network

Abstract—The main objective of this research is design and realization of real-time monitoring and alarming system for patient health, especially for patients suffering from diseases during their normal life. The proposed system has an embedded microcontroller connected to a set of medical sensors (related to the patient case) and a wireless communication module (Bluetooth). Each patient is considered as a node in a wireless sensor network and connected to a central node installed at the medical center through an internet connection. The embedded microcontroller checks if the patient health status is going well or not by analyzing the scanned medical signals. If the analysis results are abnormal, the embedded unit uses the patient's phone to transmit these signals directly to the medical center. In this case, the doctor will send medical advice to the patient to save his/her life. The implemented prototype has been tested and calibrated with standard devices. The experimental results confirm the effectiveness of the proposed system that is accurate in scanning, clear in monitoring, intelligent in decision making, reliable in communication, and cheap (about 100 US\$).

8. Toward A Wearable RFID System for Real-time Activity Recognition using Radio Patterns

Abstract—Elderly care is one of the many applications supported by real-time activity recognition systems. Traditional approaches use cameras, body sensor networks, or radio patterns from various sources for activity recognition. However, these approaches are limited due to ease-of-use, coverage, or privacy preserving issues.

In this paper, we present a novel wearable Radio Frequency Identification (RFID) system aims at providing an easy-to-use solution with high detection coverage. Our system uses passive tags which are maintenance-free and can be embedded into the clothes to reduce the wearing and maintenance efforts. A small RFID reader is also worn on the user's body to extend the detection coverage as the user moves. We exploit RFID radio patterns and extract both spatial and temporal features to characterize various activities. We also address the issues of false negative of tag readings and tag/antenna calibration, and design a fast online recognition system. Antenna and tag selection is done automatically to explore the minimum number of devices required to achieve target accuracy. We develop a prototype system which consists of a wearable RFID system and a smartphone to demonstrate the working principles, and conduct experimental studies with four subjects over two weeks. The results show that our system achieves a high recognition accuracy of 93.6% with a latency of 5 seconds. Additionally, we show that the system only requires two antennas and four tagged body parts to achieve a high recognition accuracy of 85%.

9. Enhanced Fingerprinting and Trajectory Prediction for IoT Localization in Smart Buildings

Abstract—Location service is one of the primary services in smart automated systems of Internet of Things (IoT). For various location-based services, accurate localization has become a key issue. Recently, research on IoT localization systems for smart buildings has been attracting increasing attention. In this paper, we propose a novel localization approach that utilizes the neighbor relative received signal strength to build the fingerprint database and adopts a Markov-chain prediction model to assist positioning. The approach is called the novel localization method (LNM) in short. In the proposed LNM scheme, the history data of the pedestrian's locations are analyzed to further lower the unpredictable signal fluctuations in a smart building environment, meanwhile enabling calibration-free positioning for various devices. The performance evaluation conducted in a realistic environment shows that the presented method demonstrates superior localization performance compared with well-known existing schemes, especially when the problems of device heterogeneity and WiFi signals fluctuation exist.

10. IoT based Smart HealthCare Kit

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Mob:9008611118

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ABSTRACT -The paper presents the design and implementation of an IOT-based health monitoring system for emergency medical services which can demonstrate collection, integration, and interoperation of IoT data flexibly which can

provide support to emergency medical services like Intensive Care Units(ICU), using a INTEL GALILEO 2ND generation

development board. The proposed model enables users to improve health related risks and reduce healthcare costs by collecting,

recording, analyzing and sharing large data streams in real time and efficiently. The idea of this project came so to reduce the

headache of patient to visit to doctor every time he need to check his blood pressure, heart beat rate, temperature etc. With the help of this proposal the time of both patients and doctors are saved and doctors can also help in emergency scenario as much as

possible.

11. The Design of Building Fire Monitoring System Based on ZigBee-WiFi Networks

Abstract—With the rapid development of wireless communication technology, people's life has undergone great changes. In recent years, the comfort and safety of the building environment have become a universal concern. However, building fire is the greatest threat to building safety. In consideration of the current issues on building security, the design applies the important part, the wireless sensor network technology to building fire safety monitoring system and establishes the wireless sensor network by using ZigBee technology and ZigBee-WiFi gateway which transforms ZigBee network into WiFi network, In addition, taking

advantage of the ZigBee wireless sensor network locates a fire place so that the fire information is uploaded to the handheld

terminal and the building security personnel work out the retreat and rescue plan in time. This paper provides a new solution for building fire monitoring system.

12. A Proposed Wireless System to Real Time Monitoring in Power Transformer

Abstract— This work proposed a new real time monitoring system in distribution transformer with communication through

a ZigBee network. It obtains the voltage, current, power, energy and frequency of all loads connected at the distribution

transformer. The information collected in the measurements are send to a server through a ZigBee network for safe the

information. The new real time system build a wireless network with low energy consumption and a large transmission distance

with enough conditions to work in an urban distribution electric network. This system make possible a low cost infrastructure to

do a task of save electric magnitude as well as possible diagnostic of the electrical network.

13.A Smart Switch to Connect and Disconnect Electrical Devices at Home by Using Internet

1Abstract— This paper presents the development of a firmware for a Smart Switch, which can control the on-off of any electrical

device at home by using internet. The Smart Switch is connected to internet via Wi-FiTM, through a computer, smartphone, tablet or any device with internet access. In order to perform this connection it is necessary to write the IP pre-programmed into the Smart Switch in a web browser (Internet Explorer, Chrome, Firefox, etc.) with the purpose to load the Smart Switch server,

which will open a configuration page to write the data of the user's network. Then, the user will select in automatic mode the

network, the security type, and the user must have written a passphrase. Once these information is uploaded and saved, it is

necessary to restart the Smart Switch in order to get access to internet, from which the user can control the Smart Switch

simply sending a number one or a number zero to switch the electrical device, this process is done in principle via the internet,

but it can be done without the use of internet, i.e. by using a local network.

14.CO-GPS: Energy Efficient GPS Sensing with Cloud Offloading

Abstract—Location is a fundamental service for mobile computing. Typical GPS receivers, although widely available for navigation purposes, may consume too much energy to be useful for many applications. Observing that in many sensing scenarios, the location information can be post-processed when the data is uploaded

to a server, we design a Cloud-Offloaded GPS (CO-GPS) solution that allows a sensing device to aggressively duty-cycle its GPS receiver and log just enough raw GPS signal for post-processing. Leveraging publicly available information such as GNSS satellite ephemeris and an Earth elevation database, a cloud service can derive good quality GPS locations from a few milliseconds of raw data. Using our design of a portable sensing device platform called CLEON, we evaluate the accuracy and efficiency of the solution. Compared to more than 30 seconds of heavy signal processing on standalone GPS receivers, we can achieve three orders of magnitude lower energy consumption per location tagging.

15. Smart Electricity Meter Data Intelligence for Future Energy Systems: A Survey

Abstract— Smart meters have been deployed in many countries across the world since early 2000s. The smart meter as a key element for the smart grid is expected to provide economic, social and environmental benefits for

multiple stakeholders. There has been much debate over the real values of smart meters. One of the key factors that

will determine the success of smart meters is smart meter data analytics which deal with data acquisition,

transmission, processing, and interpretation that bring benefits to all stakeholders. This paper presents a

comprehensive survey of smart electricity meters and their utilization focusing on key aspects of metering process, the

different stakeholder interests and technologies used to satisfy stakeholder interests. Furthermore the paper

highlights the challenges as well as opportunities arising due to the advent of big data and the increasing popularity

of the cloud environments.

16. Characterization of an Underwater Positioning System Based on GPS Surface Nodes

and Encoded Acoustic Signals

Abstract—This paper presents a characterization of an underwater positioning system based on surface nodes equipped with

GPS and acoustic transducers. The positioning system calculates the coordinates of an underwater vehicle in one of the surface

nodes or beacons, by the emission, detection, and reply of acoustic encoded signals. The characterization of the system

has been performed by means of a statistical study, considering different numbers of beacons, beacons' position and physical

phenomena, such as noise, multipath, and Doppler spread. The error propagation caused by these phenomena and the

geometrical configuration of the system has been quantitatively assessed in different positioning algorithms, based on trilateration

and iterative procedures. The results show how the different phenomena affect the vehicle estimated position errors for the

different positioning algorithms. In addition, the obtained errors inside the projected area of the beacons are ~1 m or lower,

rising to a few meters for the worst case scenario, showing the feasibility of the acoustic positioning system.

17. Sizing and Analysis of Renewable Energy and Battery Systems in Residential Microgrids

Abstract—Accelerated development of eco-friendly technologies such as renewable energy, smart grids, and electric transportation will shape the future of electric power generation and supply. Accordingly, the power consumption characteristics of modern power systems are designed to be more flexible, which impact the system sizing. However, integrating these considerations into the design stage can be complex. Under these terms, this paper presents a novel model based on mixed integer linear programming for the optimization of a hybrid renewable energy system with a battery energy storage system in residential microgrids in which the demand response of available controllable appliances is coherently considered in the proposed optimization problem with reduced calculation burdens. The model takes into account the intrinsic stochastic behavior of renewable energy and the uncertainty involving electric load prediction, and thus proper stochastic models are considered. This paper investigates the effect of load flexibility on the component sizing of the system for a residential microgrid in Okinawa. Also under consideration are different operation scenarios emulating technical limitations and several uncertainty levels.

18. Smart Real-Time Healthcare Monitoring and Tracking System using GSM/GPS Technologies

Abstract—Health monitoring systems have rapidly evolved recently, and smart systems have been proposed to monitor patient current health conditions, in our

proposed and implemented system, we focus on monitoring the patient's blood pressure, and his body temperature. Based on last decade statistics of medical records, death rates due to hypertensive heart disease, shows that the blood pressure is a crucial risk factor for atherosclerosis and ischemic heart diseases; thus, preventive measures should be taken against high blood pressure which provide the ability to track, trace and save patient's life at appropriate time is an essential need for mankind. Nowadays, Globalization demands Smart cities, which involves

many attributes and services, such as government services, Intelligent Transportation Systems (ITS), energy, health care,

water and waste. This paper proposes a system architecture for smart healthcare based on GSM and GPS technologies.

The objective of this work is providing an effective application for Real Time Health Monitoring and Tracking. The system

will track, trace, monitor patients and facilitate taking care of their health; so efficient medical services could be provided

at appropriate time. By Using specific sensors, the data will be captured and compared with a configurable threshold via

microcontroller which is defined by a specialized doctor who follows the patient; in any case of emergency a short message

service (SMS) will be sent to the Doctor's mobile number along with the measured values through GSM module. furthermore, the GPS provides the position information of the monitored person who is under surveillance all the time. Moreover, the paper demonstrates the feasibility of realizing a complete end-to-end smart health system responding to the real health system design requirements by taking in consideration wider vital human health parameters such as respiration rate, nerves signs ... etc. The system will be able to bridge the gap between patients - in dramatic health change occasions- and health entities who response and take actions in real time fashion.

19. Embedded control system for smart walking assistance device

Abstract—This paper presents the design and implementation of a unique control system for a smart hoist, a therapeutic device that is used in rehabilitation of walking. The control system features a unique human-machine interface that allows the human to intuitively control the system just by moving or rotating its body. The paper contains an overview of the complete system, including the design and implementation of

custom sensors, DC servo motor controllers, communication interfaces and embedded-system based central control system. The prototype of the complete

system was tested by conducting a 6-runs experiment on 11 subjects and results are showing that the proposed control system interface is indeed intuitive and simple to adopt by the user.

20. Vehicle-Assisted Device-to-Device Data Delivery for Smart Grid

Abstract—In this paper, we propose a heterogeneous framework to deliver the smart grid (SG) data cost effectively. The data generated by distributed SG loads and generation units should be delivered to the utility control center within the tolerated delay, which is crucial for SG applications. To this end, a heterogeneous communication framework is proposed, where the cellular network provides ubiquitous yet expensive data transmission and vehicle-assisted device-to-device (D2D) communications are leveraged to offload the cellular network by delivering the delay-tolerant SG data in a store-carry-andforward fashion with low cost. To improve the offloading and cost performance of the proposed framework, we put effort in the following aspects: i) optimal forwarding schemes to optimally select vehicles to carry and forward the data; ii) mode selection and dynamic resource allocation to maximize the amount of

data delivered by D2D communications, reduce the cost of SG data delivery, and guarantee the fairness among SG users. Simulation results are given to validate proposed approaches and demonstrate that the proposed framework is efficient in saving cost for the utility and offloading the cellular network.

21. Managing Contingencies in Smart Grids via the Internet of Things

Abstract—This paper proposes a framework for contingency management using smart loads, which are realized through the emerging paradigm of the Internet of things. The framework involves the system operator, the load serving entities (LSEs), and the end-users with smart home management systems that automatically control adjustable loads. The system operator uses an efficient linear equation solver to quickly calculate the load

curtailment needed at each bus to relieve congested lines after a contingency. Given this curtailment request, an LSE calculates a power allowance for each of its end-use customers to maximize the aggregate user utility. This large-scale NP-hard problem is approximated to a convex optimization for efficient computation. A smart home management system determines the appliances allowed to be used in order to maximize the user's utility within the power allowance given by the LSE. Since the user's utility depends on the near-future usage of the appliances,

the framework provides the Welch-based reactive appliance prediction (WRAP) algorithm to predict the user behavior and maximize utility. The proposed framework is validated using the New England 39-bus test system. The results show that power system components at risk can be quickly alleviated by adjusting a large number of small smart loads. Additionally, WRAP accurately predicts the users' future behavior, minimizing the impact on the aggregate users' utility.

22. Real-Time Global Localization of Robotic Cars in Lane Level via Lane Marking

Detection and Shape Registration

Abstract—In this paper, we propose an accurate and real-time positioning method for robotic cars in urban environments. The proposed method uses a robust lane marking detection algorithm, as well as an efficient shape registration algorithm between the detected lane markings and a GPS-based road shape prior, to improve the robustness and accuracy of the global localization of a robotic car. We show that, by formulating the positioning problem in a relative sense, we can estimate the global localization of a car in real time and bound its absolute error in the centimeter level by a cross-validation scheme. The cross-validation scheme integrates the vision-based lane marking detection with the shape registration, and it improves the accuracy and robustness of the overall localization system. The GPS localization can be refined by using lane marking detection when the GPS suffers from frequent satellite signal masking or blockage, whereas lane marking detection is validated and completed by the GPS-based road shape prior when it does not work well in adverse weather conditions or with poor lane signatures. We extensively evaluate the proposed method with a single forward-looking camera mounted on an autonomous vehicle that travels at 60 km/h through several urban street scenes.

23. Autonomous Wearable System for Vital Signs Measurement With Energy-Harvesting Module

Abstract—The growing demand for wearable devices is imposed by the ability to monitor in real-time critical situations

in the different areas of daily life. In many cases, power is the limiting factor for such devices. One aspect is the power supply with batteries that introduces issues due to the weight, the overall dimensions, and the disposal of the batteries. A viable solution to overcome the limitations of batteries as power source is to harvest ambient energy to power the devices directly. In this paper, a proposed wearable device with an energyharvesting module has been designed, manufactured, and tested for the measurement of vital signs. The energy-harvesting module is

implemented to directly power the electronic circuit board by a flexible solar panel. This paper describes the proposed

instrumented autonomous T-shirt powered by the flexible solar panel applied directly on the T-shirt. The instrumented T-shirt is capable of measuring respiration rate, heart rate, and movement of the body. The methodology adopted, the design choices, and the experimental results are clearly reported and discussed. The experimental results show the functioning even with poor outdoor lighting conditions and under specific indoor constraints. Tests have been conducted aiming to compare the instrumented T-shirt's output data with the data obtained via instruments as

gold standards and to show that the overall system described in this paper is capable of producing reliable data compared with the data obtained with these instruments.

24. BSN-Care: A Secure IoT-based Modern Healthcare System Using Body Sensor Network

Abstract—Advances in information and communication technologies have led to the emergence of Internet of Things (IoT). In the modern health care environment, the usage of IoT technologies brings convenience of physicians and patients since they are applied to various medical areas (such as real-time monitoring, patient information management, and healthcare management). The body sensor network (BSN) technology is one of the core technologies of IoT developments in healthcare system, where a patient can be monitored using a collection of tiny-powered and lightweight wireless sensor nodes. However, development of this new technology in healthcare applications without considering security makes patient privacy vulnerable. In this article, at first we highlight

the major security requirements in BSN based modern healthcare system. Subsequently, we propose a secure IoT based healthcare system using BSN, called BSN-Care, which can efficiently accomplish those requirements.

25. Nonlinear Coordinated Steering and Braking Control of Vision-Based Autonomous Vehicles in Emergency Obstacle Avoidance

Abstract—This paper discusses dynamic control design for automated driving of vision-based autonomous vehicles, with a special focus on the coordinated steering and braking control in emergency obstacle avoidance. An autonomous vehicle is a complex multi-input and multi-output (MIMO) system, which possesses the features of parameter uncertainties and strong nonlinearities, and the coupled phenomena of longitudinal and lateral dynamics are evident in a combined cornering and braking

maneuver. In this work, an effective coordinated control system for automated driving is proposed to deal with these coupled and nonlinear features and reject the disturbances. First, a vision algorithm is constructed to detect the reference path and provide the local location information between vehicles and reference path in real time. Then, a novel coordinated steering and braking control strategy is proposed based on the nonlinear backstepping control theory and the adaptive fuzzy sliding-mode control technique, and the asymptotic convergence of the proposed coordinated control system is proven by the Lyapunov theory. Finally, experimental tests manifest that the proposed control strategy possesses favorable tracking performance and enhances the riding comfort and stability of autonomous vehicles.

26. Generation of a Precise and Efficient Lane-Level Road Map for Intelligent Vehicle Systems

Abstract—The development of intelligent vehicle systems has resulted in an increased need for a high-precision road map. However, conventional road maps that are used for vehicle navigation systems or geographical information systems are insufficient to satisfy new requirements of intelligent vehicle systems such as autonomous driving. There are three primary road map requirements for intelligent vehicle systems: centimeter-level accuracy, storage efficiency and usability. However, no existing researches have met these three requirements simultaneously. In this paper, we propose a precise and efficient lane-level road map generation system that conforms to the requirements all together.

The proposed map building process consists of three steps: 1) data acquisition, 2) data processing, and 3) road modeling. The road data acquisition and processing system captures accurate 3D road geometry data by acquiring data with a mobile 3D laser scanner. The road geometry data is then refined to extract meta information, and in the road modeling system, the refined data is represented as sets of piecewise polynomials to ensure storage

efficiency and usability of the map. The proposed mapping system has been extensively tested and evaluated on a real urban road and highway. The experimental results show that the proposed mapping system outperforms conventional ones in terms of the road map requirements.

27. Self-Configuration and Smart Binding Control on IOT Applications

Abstract—The rapid development of wireless communication technology facilitates the realization of the Internet of Things (IOT). Self-configuration and smart connection system have become relative important issue in accordance with extensive applications of IOT, and the energy saving concepts. Therefore, this work presents the integration of 'Self-configuration and Wisdom Connection System' with Wireless Sensor Networks (WSN), IOT and ZigBee technology, to actualize selfconfiguration

based on a received signal strength indicator Received Signal Strength Indicator (RSSI), lighting autoconfiguration area, regional allocation, and sub-areas. The proposed 'Self-configuration and Wisdom Connection System' automatically configures different lightings to the same position within in the range -3dBm when the RSSI value varies only slightly. The system is configured to the same lighting site within the experimental environment when the sub-area range set - 3dBm. This study presents a significant contribution to new

configuration of objects in IOT, context awareness control, and optimization of network control platform.

28. Coexistence of ZigBee-based WBAN and WiFi for Health Telemonitoring Systems

Abstract—The development of telemonitoring via wireless body area networks (WBANs) is an evolving direction in personalized medicine and home-based mobile health. A WBAN consists of small, intelligent medical sensors which collect physiological parameters such as EKG (electrocardiogram), EEG (electroencephalography)

and blood pressure. The recorded physiological signals are sent to a coordinator via wireless technologies, and

are then transmitted to a healthcare monitoring center. One of the most widely used wireless technologies in WBANs is ZigBee because it is targeted at applications that require a low data rate and long battery life. However, ZigBee-based WBANs face severe interference problems in the presence of WiFi networks. This problem is caused by the fact that most ZigBee channels overlap with WiFi channels, severely affecting the ability of healthcare monitoring systems to guarantee reliable delivery of physiological signals. To solve this problem, we have developed an

algorithm that controls the load in WiFi networks to guarantee the delay requirement for physiological signals, especially for emergency messages, in environments with coexistence of ZigBeebased WBAN and WiFi. Since WiFi applications generate traffic with different delay requirements, we focus only on WiFi traffic that does not have stringent timing requirements. In this paper, therefore, we propose an adaptive load control algorithm for

ZigBee-based WBAN/WiFi coexistence environments, with the aim of guaranteeing that the delay experienced by ZigBee sensors does not exceed a maximally tolerable period of time. Simulation results show that our proposed algorithm guarantees the delay performance of ZigBee-based WBANs by mitigating the effects of WiFi interference in various scenarios.

29. Prefetching-Based Data Dissemination in Vehicular Cloud Systems

Abstract—In the last decade, vehicular ad-hoc networks (VANETs) have been widely studied as an effective method

for providing wireless communication connectivity in vehicular transportation systems. In particular, vehicular cloud systems have received abundant interest for the ability to offer a variety of vehicle information services. We consider the data dissemination problem of providing reliable data delivery services from a cloud data center to vehicles through roadside wireless access points (APs) with local data storage. Due to intermittent wireless connectivity and the limited data storage size of roadside wireless APs, the question of how to use the limited resources of the

wireless APs is one of the most pressing issues affecting data dissemination efficiency in vehicular cloud systems. In this paper, we devise a vehicle route-based data prefetching scheme, which maximizes data dissemination success probability in an average sense when the size of local data storage is limited and wireless connectivity is stochastically unknown. We propose a greedy algorithm and an online learning algorithm for deterministic

and stochastic cases, respectively, to decide how to prefetch a set of data of interest from a data center to roadside wireless APs. Experiment results indicate that the proposed algorithms can achieve efficient data dissemination in a variety of vehicular scenarios.

30. ZigBee Network System for Observing Operating Activities of Work Vehicles

Abstract— Observing activities of working vehicles on a work site, such as a factory, is important in regard to managing the lifetime of vehicles and achieving high operational availability. However, it is a problem that an administrator cannot completely grasp the activities of a working vehicle. Existing systems cannot cover a large area, particularly in an indoor environment. A system is proposed for monitoring operating activities of working vehicles, regardless of whether they are operating indoors or outdoors. The system calculates the activity rate of a vehicle by analyzing the topology of a network configured by the wireless technology ZigBee. In addition, it was experimentally verified that network topology and RSSI can be used to estimate activities of working vehicles.

31. An Integrated Cloud-Based Smart Home Management System with Community Hierarchy

Abstract — This paper presents a smart home management system in which a community broker role is used for integrating community services, thereby reducing the workload of community management staff, providing

electronic information services, and deepening the community's integration with the surrounding environment. At

the home end, a home intranet was created by integrating a fixed touch panel with a home controller system and various sensors and devices to deliver, for example, energy, scenario information, and security functions. The community end comprises a community server and community personal computers, and connects to devices (e.g., video cameras and building automation devices) in other community systems and to the home networks. Furthermore, to achieve multiple inhome displays, standard interface devices can be employed to separate the logic and user interfaces. This study also determined that the message queuing telemetry transport protocol can provide optimal home control services in smart home systems, whereas hypertext transfer protocol is optimal

for delivering location-based information integration services¹.

32. Point-n-Press: An Intelligent Universal Remote Control System for Home Appliances

Abstract—With numerous connected devices and appliances, the smart home is one of the representative fields of Internet of Things (IoT). As the complexity of devices/appliances increase, numerous buttons (sometimes dozens) are designed on the remote controller in home spaces even if several of them are seldom used. A user may be confused with the controller even if he or she only intends to perform a simple operation. This confusion also leads

to a higher probability of mal-operations. In addition, conventional methods of communication between remote controllers and connected devices, such as eXtensible Markup Language (XML) messages, are usually bandwidth-consumptive. To address these problems, an intelligent universal remote control system for home appliances named Point-n-Press is proposed. Point-n-Press addresses the directionality feature, which enables easy and intuitive

control by pointing to the target device to display the target's control interface on the screen of the remote controller. By leveraging the state dependencies of home device/appliance operations, only functional buttons that are relevant to the current context are utilized. Two real prototypes are implemented to verify the feasibility of the proposed scheme. The evaluation results show that Point-n-Press is a useful and suitable control scheme for

IoT-based smart homes.

33. Smart Configuration of Smart Environments

Abstract—One of the central research challenges in the Internet of Things and Ubiquitous Computing domains is how users can be enabled to “program” their personal and industrial smart environments by combining services that are provided by devices around them. We present a service composition system that enables the goal-driven configuration of smart environments for end users by combining semantic metadata and reasoning with a visual

modeling tool. In contrast to process-driven approaches where service mashups are statically defined, we make use of embedded semantic API descriptions to dynamically create mashups that fulfill the user’s goal. The main advantage of our system is its high degree of flexibility, as service mashups can adapt to dynamic environments

and are fault-tolerant with respect to individual services becoming unavailable. To support users in expressing their goals, we integrated a visual programming tool with our system that allows to model the desired state of a smart environment graphically, thereby hiding the technicalities of the underlying semantics. Possible applications of the presented system include the management of smart homes to increase individual well-being, and reconfigurations of smart environments, for instance in the industrial automation or healthcare domains.

34. Classifying a Person’s Degree of Accessibility from Natural Body Language During Social

Human–Robot Interactions

Abstract—For social robots to be successfully integrated and accepted within society, they need to be able to interpret human social cues that are displayed through natural modes of communication. In particular, a key challenge in the design of social robots is developing the robot’s ability to recognize a person’s affective

states (emotions, moods, and attitudes) in order to respond appropriately during social human–robot interactions (HRIs). In this paper, we present and discuss social HRI experiments we have conducted to investigate the development of an accessibility-aware social robot able to autonomously determine a person’s degree of accessibility (rapport, openness) toward the robot based on the person’s natural static body language. In particular, we

present two one-on-one HRI experiments to: 1) determine the performance of our automated system in being able to recognize and classify a person’s accessibility levels and 2) investigate how people interact with an accessibility-aware robot which determines its own behaviors based on a person’s speech and accessibility levels.

35. A Rule-based Service Customization Strategy for Smart Home Context-aware Automation

Abstract—The continuous technical progress of the smartphone built-in modules and embedded sensing techniques has created chances for context-aware automation and decision support in home environments. Studies in this area mainly focus on feasibility demonstrations of the emerging techniques and system architecture design that are applicable to the different usecases. It lacks service customization strategies tailoring the computing service to proactively satisfy users' expectations. This investigation aims to chart the challenges to take advantage of the dynamic varying context information, and provide solutions to customize the computing service to the contextual situations. This work presents a rule-based service customization strategy which employs a semantic distance-based rule matching method for context-aware service decision making and a Rough Set Theory-based rule generation method to supervise the service customization. The simulation study reveals the trend of the algorithms in time complexity with the number of rules and context items. A prototype smart home system is implemented based on smartphones and commercially available low-cost sensors and embedded electronics. Results demonstrate the feasibility of the proposed strategy in handling the heterogeneous context for decision making and dealing with history context to discover the underlying rules. It shows great potential in employing the proposed strategy for context-aware automation and decision support in smart home applications.

36. A Cyber-Physical System for Environmental Monitoring

Abstract—This paper presents the development of a cyberphysical system that monitors the environmental conditions or the ambient conditions in indoor spaces at remote locations. The communication between the system's components is performed using the existent wireless infrastructure based on the IEEE 802.11 b/g standards. The resulted solution provides the possibility of logging measurements from locations all over the world and of visualizing and analyzing the gathered data from any device connected to the Internet. This work encompasses the complete solution, a cyber-physical system, starting from the physical level, consisting of sensors and the communication

protocol, and reaching data management and storage at the cyber level. The experimental results show that the proposed system represents a viable and straightforward solution for environmental and ambient monitoring applications.

37. Autonomous Gas Detection and Mapping With Unmanned Aerial Vehicles

Abstract—Unmanned aerial vehicles (UAVs) are nowadays largely employed in civil applications. One of the most promising applications is the environmental monitoring (or risk assessment). We propose a battery-powered eNose board that can be embedded with any type of drone. We evaluated the effectiveness of the sensing method by means of field experiments using the prototype as payload of a hexacopter. The results show that the analysis of the target environmental parameters is not perturbed by the air flow generated by propellers. The system is suitable

for any type of mobile carrier (UAVs or wheeled robots), thanks to its lightweight and compact form factor. To further extend the limited flight autonomy of the carrier, we developed an optimal monitoring algorithm for gas leakage localization, a simulating framework to evaluate its performance, and we provide a design space exploration for solar-powered drones.

38. Non-Intrusive Planning the Roadside Infrastructure for Vehicular Networks

Abstract—In this article, we describe a strategy for planning the roadside infrastructure for vehicular networks based on the global behavior of drivers. Instead of relying on the trajectories of all vehicles, our proposal relies on the migration ratios of vehicles between urban regions in order to infer the better locations for deploying the roadside units. By relying on the global behavior of drivers, our strategy does not incur in privacy concerns. Given a

set of α available roadside units, our goal is to select those α -better locations for placing the roadside units in order to maximize the number of distinct vehicles experiencing at least one V2I contact opportunity. Our results demonstrate that full knowledge of the vehicle trajectories are not mandatory for achieving a close-to-optimal deployment performance when we intend to maximize the number of distinct vehicles experiencing (at least one) V2I contact

opportunities.

39. A Time Synchronization Technique for CoAP-based Home Automation Systems

Abstract — With the advent of internet-of-things (IoT)-based home automation systems, time synchronization techniques for low power sensor modules are in high demand. The constrained application protocol (CoAP) was recently standardized for sensor networks by IETF and is becoming widely adopted for home automation systems by ETSI, OMA, and oneM2M. The network time protocol (NTP) is not applicable to home automation systems due to its limited computing resources. This paper proposes a lightweight time synchronization algorithm for CoAP-based home

automation system networks. The CoAP option field and a shim header are used to include time-stamps in the home automation system. The proposed scheme can thus be applied to both IP-based and non-IP-based home automation

systems. In experiments with several household devices having non-IP communication interfaces, experimental results show that the proposed technique gives an average error of 1 ms and a network overhead reduction of 17% when compared to the ideal NTP service¹.

40. Low-power wearable ECG monitoring system for multiple-patient remote monitoring

Abstract—Many devices and solutions for remote ECG monitoring have been proposed in the literature. These solutions typically have a large marginal cost per added sensor and are not seamlessly integrated with other smart home solutions. Here we propose an ECG remote monitoring system that is dedicated to non-technical users in need of long-term health monitoring in residential environments and is integrated in a broader Internet of Things (IoT) infrastructure. Our prototype consists of a complete vertical solution with a series of advantages with respect to the state of the art, considering both prototypes with integrated front end and prototypes realized with off-the-shelf

components: i) ECG prototype sensors with record-low energy per effective number of quantized levels, ii) an architecture providing low marginal cost per added sensor/user, iii) the possibility of seamless integration with other smart home systems through a single internet-of-things infrastructure.

41. High-Precision Vehicle Navigation in Urban Environments Using an MEM's IMU and

Single-Frequency GPS Receiver

Abstract—Many applications demand high-precision navigation in urban environments. Two frequency real-time kinematic (RTK) Global Positioning System (GPS) receivers are too expensive for low-cost or consumer-grade projects. As single-frequency GPS receivers are getting less expensive and more capable, more people

are utilizing single-frequency RTK GPS techniques to achieve high accuracy in such applications. However, compared with dual-frequency receivers, it is much more difficult to resolve the integer ambiguity vector using single-frequency phase measurements and therefore more difficult to achieve reliable high-precision navigation. This paper presents a real-time sliding-window estimator that tightly integrates differential GPS and an inertial measurement unit to achieve reliable high-precision navigation performance in GPS-challenged urban environments using low-

cost single-frequency GPS receivers. Moreover, this paper proposes a novel method to utilize the phase measurements, without resolving the integer ambiguity vector. Experimental results demonstrate real-time position estimation performance at the decimeter level. Furthermore, the novel use of phase measurements improves the robustness of the estimator to pseudorange multipath error.

42. Electronic Visits in Primary Care: Modeling, Analysis, and Scheduling Policies

Abstract—Primary care, the backbone of the nation's healthcare system, is at the risk of collapse. Patients are dissatisfied due to poor access to care, and physicians are unhappy and burning out with an enormous amount of tasks. To improve the primary care access, many healthcare organizations have introduced electronic visits (or e-visits) to provide patient–physician communications through securing messages. In this paper, we introduce an analytical model to study e-visits in primary care clinics. Analytical formulas to evaluate the mean and variance of the patient length of visit in primary care clinics with e-visits are derived. System properties are investigated. In addition, comparisons of different scheduling policies between the office and the e-visits are carried out. The first come

first serve, preemptive-resume, and non-preemptive policies are studied and the results show that the first come first serve policy typically leads to the best performance.

43. Characterization of an Underwater Positioning System Based on GPS Surface Nodes and Encoded Acoustic Signals

Abstract—This paper presents a characterization of an underwater positioning system based on surface nodes equipped with GPS and acoustic transducers. The positioning system calculates the coordinates of an underwater vehicle in one of the surface nodes or beacons, by the emission, detection, and reply of acoustic encoded signals. The characterization of the system has been performed by means of a statistical study, considering different numbers of beacons, beacons' position and physical phenomena, such as noise, multipath, and Doppler spread. The error propagation caused by these phenomena and the geometrical configuration of the system has been quantitatively

assessed in different positioning algorithms, based on trilateration and iterative procedures. The results show how the different phenomena affect the vehicle estimated position errors for the different positioning algorithms. In addition, the obtained errors inside the projected area of the beacons are ~ 1 m or lower, rising to a few meters for the worst case scenario, showing the feasibility of the acoustic positioning system.

44. Sizing and Analysis of Renewable Energy and Battery Systems in Residential Microgrids

Abstract—Accelerated development of eco-friendly technologies such as renewable energy, smart grids, and electric transportation will shape the future of electric power generation and supply. Accordingly, the power consumption characteristics of modern power systems are designed to be more flexible, which impact the system sizing. However, integrating these considerations into the design stage can be complex. Under these terms, this paper presents a novel model based on mixed integer linear programming for the optimization of a hybrid renewable energy system with a battery energy storage system in residential microgrids in which the demand response of available controllable

appliances is coherently considered in the proposed optimization problem with reduced calculation burdens. The model takes into account the intrinsic stochastic behavior of renewable energy and the uncertainty involving electric load prediction, and thus proper stochastic models are considered. This paper investigates the effect of load flexibility on the component sizing of the system for a residential microgrid in Okinawa. Also under consideration are different operation scenarios emulating technical limitations and several uncertainty levels.

45. Embedded control system for smart walking

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The prototype of the complete system was tested by conducting a 6-runs experiment on 11 subjects and results are showing that the proposed control system interface is indeed intuitive and simple to adopt by the user.

46. Measurement System With Accelerometer Integrated RFID Tag for Infrastructure

Health Monitoring

Abstract—This paper presents a measurement system for measuring dynamic acceleration of infrastructure remotely using semipassive radio-frequency identification (RFID) tag. This measurement is critical to the vibration-based method

for infrastructure health monitoring. Design considerations of accelerometer integrated ultrahigh-frequency RFID tag and dynamic acceleration measurements through an RFID wireless link are discussed. Measurement results of the system for a structural specimen have shown that it is capable of acquiring data which provides the information of natural frequency of the structural specimen. Moreover, the system can distinctively identify the state changes of the structural specimen by natural frequency shifts. These results are benchmarked against the results obtained with two commercial systems. It is shown that the standard deviation of the measurement of the natural frequency is ± 0.01 Hz which is very close to the standard deviation of the commercial measurement systems.

47. Prefetching-Based Data Dissemination in Vehicular Cloud Systems

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for providing wireless communication connectivity in vehicular transportation systems. In particular, vehicular cloud systems have received abundant interest for the ability to offer a variety of vehicle information services. We consider the data dissemination problem of providing reliable data delivery services from a cloud data center to vehicles through roadside wireless access points (APs) with local data storage. Due to intermittent wireless connectivity and the limited data storage size of roadside wireless APs, the question of how to use the limited resources of the wireless APs is one of the most pressing issues affecting data dissemination efficiency in vehicular cloud systems. In this paper, we devise a vehicle route-based data prefetching scheme, which maximizes data dissemination success probability in an average sense when the size of local data storage is limited and wireless connectivity is stochastically unknown. We propose a greedy algorithm and an online learning algorithm for deterministic and stochastic cases, respectively, to decide how to prefetch a set of data of interest from a data center to roadside wireless APs. Experiment results indicate that the proposed algorithms can achieve efficient data dissemination in a variety of vehicular scenarios.

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Mob:9008611118

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