IEEE 2017 BASEPAPERS

S.NO	TITLE	YEAR	ABSTRACT
SMES-01 (Robotics)	Low-cost robotic assessment of visual-motor deficits in Alzheimer's disease	2017-2018	A low-cost robotic interface was used to assess the visuo-motor performance of patients with Alzheimer's disease (AD). Twenty AD patients and twenty age-matched controls participated in the study. The battery of tests included simple Reaction times, position tracking and stabilization tasks performed with both hands. The regularity, velocity, visual and haptic feedback were manipulated to vary movement complexity. Reaction times and movement tracking error were analyzed. Results show a marked group effect on a subset of conditions, in particular when the patients could not rely on the visual feedback of hand movement. The visuo-motor performance correlated with measures of global cognitive functioning (MMSE) and with different memory-related abilities. Our results support the hypothesis that the ability to recall and use visuo-spatial associations might underlie impairment in complex motor behavior that has been reported in AD patients. Importantly, the patients had preserved learning effects across sessions, which Might relate to visuo-motor deficits being less evident in everyday life and clinical assessments. This robotic assessment, lasting less than an hour, provides detailed information about the integrity of visuo-motor abilities. The data can aid understanding of the complex pattern of deficits that characterizes this pervasive disease.
SMES-02 (IoT)	A Survey on Network Methodologies for Real-Time Analytics of Massive IoT Data and Open Research Issues	2017- 018	With the widespread adoption of the Internet of Things (IoT), the number of connected devices is growing at an exponential rate, which is contributing to ever-increasing, massive data volumes. Real-time analytics on the massive IoT

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			Data, referred to as the "real-time IoT analytics" in this paper, is becoming the mainstream with an aim to provide an immediate or non-immediate actionable insights and business intelligence. However, the analytics network of the existing IoT systems does not adequately consider the requirements of the real-time IoT analytics. In fact, most researchers overlooked an appropriate Design of the IoT analytics network while focusing much on the sensing and delivery networks of the IoT system. Since much of the IoT analytics network has often been taken as granted, the survey, in this paper, we aim to review the state-of-the-art of the analytics network methodologies, which are suitable for real time IoT analytics. In this vein, we first describe the basics of the real-time IoT analytics, use cases, and software platforms, and then explain the shortcomings of the network methodologies to support them. To address those shortcomings, we then discuss the relevant network methodologies which may support the real-time IoT analytics. Also, we present a number of prospective research problems and future research directions focusing on the network methodologies for the real-time IoT analytics.
SMES-03 (IoT)	Machine-to-Machine Communications in Ultra-Dense Networks – A Survey	2017-2018	To achieve 1000-fold capacity increase in 5G wireless communications, ultra-dense network (UDN) is believed to be one of the key enabling technologies. Most of the previous research activities on UDNs were based very much on human-tohuman (H2H) communications. However, to provide ubiquitous Internet of Things (IoT) services, machine-to-machine (M2M) communications will play a critical role in 5G

IEEE 2017 BASEPAPERS

			systems. As the number of machine-oriented connections increases, it is expected that supporting M2M communications is an essential Requirement in all future UDNs. In this paper, we aim to bridge the gaps between M2M communications and UDNs, which were commonly considered as two separate issues in the literature. The paper begins with a brief introduction on M2M communications and UDNs, and then will discuss the issues on the roles of M2M communications in future UDNs. We will identify different ways to implement M2M communications in the UDNs from the perspectives of layered architecture, including physical (PHY), media access control (MAC), network, and application layers. Other two important issues, i.e., security and network virtualization, will also be addressed. Before the end of this paper, we will give a summary on identified research topics for future studies.
SMES-04 (IoT)	IoT Localization for biostatic Passive UHF RFID Systems with 3D Radiation Pattern	2017-2018	Passive Radio-Frequency Identification (RFID) Systems carry critical importance for Internet of Things (IoT) applications due to their energy harvesting capabilities. RFID based position estimation, in particular, is expected to facilitate a wide array of location based services for IoT applications with low-power requirements. In this paper, considering monocratic and biostatic configurations and 3D antenna radiation pattern, we investigate the accuracy of received signal strength based wireless localization using passive ultra-high frequency (UHF) RFID systems. The Cramer-Rao Lower Bound (CRLB) for the localization accuracy is derived, and is compared with the accuracy of maximum likelihood

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			estimators for various RFID antenna configurations. Numerical results show that due to RFID tag/antenna sensitivity, and the directional antenna pattern, the localization accuracy can degrade at blind locations that remain outside of the RFID reader antennas' main beam patterns. In such cases optimizing elevation angle of antennas are shown to improve localization coverage, while using biostatic configuration improves localization accuracy significantly
SMES-05 (IoT)	Home Automation and Personalization Through Individual Location Determination	2017-2018	The focus of this project is to develop a prototype to demonstrate the utility of individualized location determination for home automation. While current home automation systems provide localization at a GPS level, they do not identify users' locations within a building. The smart home technology market is growing rapidly and this feature can differentiate a product line by adding unique capabilities for the consumer. The objective for this system is to use individualized location determination to improve lifestyle areas in the home in passive and non-intrusive ways. Being passive is important in that users should not have to take extra steps (e.g., pushing a button when they enter a room) as they move throughout their house. Being non-intrusive is important because users should not have to wear anything extra (e.g., a special armband) or have personal information scanned (e.g., facial recognition camera). The system will use Bluetooth Low Energy (BLE) to identify and track users' movements throughout a house, where the BLE signal of an individual will be associated with a smartphone or fitness wearable that they

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			normally carry with them. A unique aspect of this project is the implementation of a flipped BLE architecture, which is implemented with a Texas Instruments development board that acts as a beacon to identify users based on their BLE signals from their smartphones and wearables. This architecture is "flipped" because most BLE beacons rely on a smartphone to "see" the beacons whereas the beacons in this system are "seeing" the smartphones. After identifying BLE devices in proximity to the beacon, the prototype system will record readings on the beacon locally, store data in an SQL database, and clean and process data through a PHP script. Different use cases for the BLE system within a house were considered. The final prototype will focus on a Smart Thermostat application which automatically adjusts where a thermostat reads the indoor temperature based on the location of the users. Results include a fully functioning prototype that can be used to demonstrate feasibility of the home automation use cases. Test results from the prototype include using a factorial experiment to measure the effect of distance and obstacles on the signal strength readings as well as performance on the system through a range of scenarios.
SMES-06 (IoT)	Wearable Sensors for Analyzing Personal Exposure to Air Pollution	2017-2018	This paper describes hardware developments in a wearable air quality sensor assembly for analyzing personal exposure to air pollution. According to the World Health Organization, exposure to air pollution is now the largest single environmental health risk globally, leading to approximately 7

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			million deaths in 2012 alone. Understanding personal exposure from traditional stationary and spatially disperse monitoring stations is challenging, particularly in urban environments with multiple pollutant sources and complex transport dynamics. Portable air quality sensors have the potential to fill in the gap left by Traditional air pollution monitoring. Air pollution sensor technology is decreasing in cost and size, meaning it is now tenable to use low-cost portable air pollution sensors. The data collected by the wearable air quality sensor assembly, EnviroSensor 2.0, includes measurements of ozone, particulate matter, temperature, humidity, latitude, and longitude.
SMES-07 (GSM)	Anti-theft Protection of Vehicle by GSM & GPS with Fingerprint Verification	2017-2018	Recently vehicle tracking system is getting vast Popularity because of the rising number of the stolen vehicles. Vehicle theft is happening on parking and sometimes driving in unsecured places. This research work explores how to avoid this kind of stealing and provides more security to the vehicles. The implemented system contains single-board embedded system which is equipped with global system for mobile (GSM) and global positioning system (GPS) along with a microcontroller installed in the vehicle. The use of GSM and GPS technologies allows the system to track the object and provides the most up-to date information about on-going trips. Moreover, fingerprint verification is done in the implemented system to ensure the driving of correct person. The implemented system is very simple with greater security for vehicle anti-theft protection and low cost technique compared to others.

IEEE 2017 BASEPAPERS

SMES-08 (Robotics)	Efficient Visual Obstacle Avoidance for Robotic Mower	2017-2018	We present a novel method for robotic mower's Lawn obstacle avoidance as well as motion control, which is based on the Gabor texture classification and drivable region search methods. In our approach, a camera is applied to obtain Real-time image streams of lawn scenes, Gabor filters are then applied for extracting robust texture features. Based on the compressed features, a SVM model is trained and used to perform the grass texture classification task. The maximum connected drivable region is computed via a breadth-first search method (BFS) according to the classification results. By restricting the BFS method in a polygon window area, we accelerate the region search step by 64% compared with searching the whole image. The whole program is built on the Robot Operating System (ROS) for the purpose of expansion. Experiments have been performed on the robotic mower under complex scenes, including various obstacles, seasons and lighting conditions. The obstacle avoidance rate tested is 97.7% in a 75 m*40 m area, which proves the efficiency and superiority of our proposed method.
SMES-09 (IoT)	Security and Privacy Preservation Scheme of Face Identification and Resolution Framework Using Fog Computing in Internet of Things	2017-2018	Face identification and resolution technology is crucial to ensure the identity consistency of humans in physical space and cyber space. In current Internet of Things (IoT) and big data situation, the increase of applications based on Face identification and resolution raises the demands of computation, communication and storage capabilities. Therefore, we have proposed the fog computing based face identification and

IEEE 2017 BASEPAPERS

			Resolution framework to improve processing capacity and save the bandwidth. However, there are some security and privacy issues brought by the properties of fog computing based framework. In this paper, we propose a security and privacy preservation scheme to solve above issues. We give an outline of the fog computing based face identification and resolution framework, and summarize the security and privacy issues. Then the authentication and session key agreement scheme, data encryption scheme, and data integrity checking scheme are proposed to solve the issues of confidentiality, integrity, and availability in the processes of face identification and face resolution. Finally, we implement a prototype system to evaluate the influence of security scheme on system performance. Meanwhile, we also evaluate and analyze the security properties of proposed scheme from the Viewpoint of logical formal proof and the CIA (confidentiality, integrity, availability) properties of information security. The results indicate that the proposed scheme can effectively meet the requirements for security and privacy preservation.
SMES-10 (IoT)	Indoor Localization Framework with Wi-Fi Fingerprinting	2017-2018	Indoor localization through Wi-Fi fingerprinting requires a large number of fine-grained data samples. This study presents a data acquisition and indoor localization framework that collects crowd-sourced Wi-Fi received signal strength data in a metropolitan high-rise building and predicts location through Wi-Fi fingerprinting. The framework consists of a server and an Android application and was tested at NYIT for data

IEEE 2017 BASEPAPERS

			collection for two weeks in December 2016. The dataset was preprocessed and analyzed through linear support vector machine to test location prediction accuracy. Various feature selection schemes were compared for their location prediction accuracy. We show that a small subset of features suffices to provide high location prediction accuracy. The average location prediction accuracy increases from 83% to 100% when time features are considered comparing to using only spatial features.
SMES-11 (Robotics)	Managing Robot Kinematics Based on Arduino Controllers Using a Unity System	2017-2018	This paper contains investigation on managing robot kinematics based on Arduino controllers using a Unity system. The developed system allows performing different operations using the specially developed software to perform movement of the robotic arm and to define position objects into the certain positions.
SMES-12 (IoT)	Security Vulnerabilities of Internet of Things: A Case Study of the Smart Plug System	2017-2018	With the rapid development of the Internet of Things (IoT), more and more small devices are connected into the Internet for monitoring and control purposes. One such type of devices, smart plugs, have been extensively deployed worldwide in millions of homes for home automation. These smart plugs, however, would pose serious security problems if their vulnerabilities were not carefully investigated. Indeed, we discovered that some popular smart home plugs have severe security vulnerabilities which could be fixed but unfortunately are left open. In this paper, we case study a smart plug system of a known brand by exploiting its communication protocols and successfully launching four attacks: device scanning attack, brute force attack, spoofing

IEEE 2017 BASEPAPERS

			attack, and firmware attack. Our real-world experimental results show that we can obtain the authentication credentials from the users by performing these attacks. We also present guidelines for securing smart plugs.
SMES-13 (GSM)	Design and Implementation of Real Time Transformer Health Monitoring System Using GSM Technology	2017-2018	With the progress and development of national Economy as well as power system, reliability and safety issues of power system have been more important. Development of distribution Transformer Health Monitoring System (THMS) has been done in that reason. Distribution transformer is the most vital asset in any electrical distribution network and therefore it needs special care and attention. This THMS can Monitor the health status of the distribution transformer in real time aspect. As a large number of transformers are distributed over a wide area in present electric systems, it's difficult to monitor the condition manually of every single transformer. So automatic data acquisition and transformer condition monitoring has been an important issue. This project presents design and implementation of a mobile embedded system to monitor load currents, over voltage, transformer oil level and oil temperature. The implementation on-line monitoring system integrates Global Service Mobile (GSM) Modem, with single chip microcontroller and sensors. It is installed at the distribution transformer site. The output values of sensors are processed and recorded in the system memory. System programmed with some predefined instructions to check abnormal conditions. If there is any abnormality on the system, the GSM module will send SMS (Short Message Service) messages to designated mobile

IEEE 2017 BASEPAPERS

			telephones containing information about the abnormality according to the aforesaid predefined instructions. This mobile system will help the utilities to optimally utilize transformers and identify problems before any catastrophic failure occurs. This system will be an advanced step to the automation by diminishing human dependency. As it is a wireless communicating system, there is no need of large cables which are of high cost. Thus THMS offers a more improved transformer monitoring.
SMES-14 (Robotics)	Bio-inspired ciliary force sensor for robotic Platforms	2017-2018	The detection of small forces is of great interest in any robotic application that involves interaction with the environment (e.g. objects manipulation, physical human-robot interaction, minimally invasive surgery), since it allows the robot to detect the contacts early on and to act accordingly. In this work, we present a sensor design inspired by the ciliary structure frequently found in nature, consisting of an array of permanently magnetized cylinders (cilia) patterned over a giant magneto resistance sensor (GMR). When these cylinders are deformed in shape due to applied forces, the stray magnetic field variation will change the GMR sensor resistivity, thus enabling the electrical measurement of the applied force. In this paper we present two 33 mm2 prototypes composed of an array of 5 cilia with 1 mm of height and 120 m and 200 m of diameter for each prototype. A minimum force of 333 N was measured. A simulation model for determining the magnetized cylinders average stray magnetic field is also presented.

IEEE 2017 BASEPAPERS

SMES-15 (IoT)	Secure and Efficient Protocol for Route Optimization in PMIPv6-based Smart Home IoT Networks	2017-2018	The communication in the Smart Home Internet of Things (SH-IoT) comprising various electronic devices and sensors is very sensitive and crucial. In addition, the key requirements of SH-IoT include channel security, handover support, mobility management, and consistent data rates. Proxy Mobile IPv6 (PMIPv6) is considered as one of the core solutions to handle extreme mobility; however, the default PMIPv6 cannot ensure performance enhancement in SH-IoT scenarios, i.e. Route Optimization (RO). The existing security protocols for PMIPv6 cannot support secure RO for SH-IoT services where Mobile Nodes (MNs) communicate with home IoT devices not belonging to their domain. Motivated by this, a secure protocol is proposed, which uses trust between PMIPv6 domain and smart home to ensure security as well as performance over the path between MNs and home IoT devices. The proposed protocol includes steps for secure RO and handover management where mutual authentication, key exchange, perfect forward secrecy, and privacy are supported. The correctness of the proposed protocol is formally analyzed using BAN-logic and AVISPA. Further, network simulations are conducted to evaluate the performance efficiency of the proposed protocol. The results show that the proposed approach is capable of providing secure transmission by resolving the RO problem in PMIPv6 along with the reduction in handover latency, end to end delay and packet loss, and enhancement in throughput and transmission rate even during the handover phase.

IEEE 2017 BASEPAPERS

SMES-16 (GSM)	An Arduino-Based Subsystem for Controlling UAVs Through GSM	2017-2018	Long distance and beyond sight of view communication between a ground control station and an Unmanned Aerial Vehicle (UAV) is mainly achieved using high-gain antennas, antenna trackers or satellites. These implementations demand expensive, heavy and not easily deployed equipment, while in many cases cannot provide a sufficient communication range. The current work proposes and demonstrates a lightweight and low-cost Arduino-based telecommunication subsystem that is capable of sending control commands to the UAV based on GSM or GPRS the most widely deployed cellular networks standard. During field trials control commands successfully transferred from a mobile phone as well as a laptop to the UAV autopilot, with an average time of 2.6 sec and 0.5 sec respectively. The proposed subsystem can be embedded independently or coexist with other control systems, contributing to a ubiquitous UAVs management system.
SMES-17 (IoT)	A Privacy Preserving Communication Protocol for IoT Applications in Smart Homes	2017-2018	The development of the Internet of Things (IoT) has made extraordinary progress in recent years in both academic and industrial fields. There are quite a few smart home systems that have been developed by major companies to achieve home automation. However, the nature of smart homes inevitably raises security and privacy concerns. In this paper, we propose an improved energy-efficient, secure, and privacy-preserving communication protocol for the smart home systems. In our proposed scheme, data transmissions within the smart home system are Secured by a symmetric encryption scheme with secret keys being generated by chaotic systems.

IEEE 2017 BASEPAPERS

			Meanwhile, we incorporate Message Authentication Codes (MAC) to our scheme to guarantee data integrity and authenticity. We also provide detailed security analysis and performance evaluation in comparison with our Previous work in terms of computational complexity, memory cost, and communication overhead.
SMES-18 (Robotics)	Closed-Chain Manipulation of Large Objects by Multi-Arm Robotic Systems	2017-2018	Closed kinematic chains are created whenever multiple robot arms concurrently manipulate a single object. The closed-chain constraint, when coupled with robot joint limits, dramatically changes the connectivity of the configuration space. We propose a regrasping move, termed "IK-switch", which allows efficiently bridging components of the configuration space that are otherwise mutually disconnected. This move combined with several other developments, such as a method to stabilize the manipulated object using the environment, a new tree structure, and a compliant control scheme, enables us to address complex closed-chain manipulation tasks, such as flipping a chair frame, which is otherwise impossible to realize using existing multi-arm planning methods.
SMES-19 (IoT)	**Accurate Indoor Localization and Tracking Using Mobile Phone Inertial Sensors, WiFi and iBeacon**	2017-2018	In this paper, we propose a robust and accurate Indoor localization and tracking system using smartphone built-in inertial measurement unit (IMU) sensors, Wi-Fi received signal strength measurements and opportunistic I Beacon corrections based on particle filter. We utilize Pedestrian Dead Reckoning (PDR) approach which leverages smartphone equipped accelerometers, gyroscope and magnetometer to estimate the

IEEE 2017 BASEPAPERS

			walking distance and direction of user. The position estimated by Wi-Fi fingerprinting based approach is fused with PDR to reduce its drifting error. Since the number of WiFi routers is usually limited for localization in large-scale indoor environment, we employ the emerging iBeacon technology to occasionally correct the drifting error of PDR in poor WiFi coverage area. Extensive experiments have been conducted and verified the superiority of the proposed system in terms of localization accuracy and robustness.
SMES-20	Intelligent Traffic Management System for Cross Section of Roads Using Computer Vision	2017-2018	This paper includes the design and implementation of an intelligent and automated traffic control system which takes advantages of computer vision and image processing techniques. Along with conventional computer vision techniques, this paper introduces two new methods which has low processing cost. One of the methods has been constructed with the help of hardware and the other one is designed without hardware support. This is a complete traffic management system which has been able to reduce traffic jams and congestion on simulated environment. It detects the number of vehicles on each road and depending on the vehicles load on each road, this system assigns optimized amount of waiting time (red signal light) and running time (green signal light). This system is a fully automated system that can replace the conventional pre-determined fixed-time based traffic system with a dynamically managed traffic system. It can also detect vehicle condition on road and auto-adjust the system according to the changing road conditions which makes the system intelligent. The designed

IEEE 2017 BASEPAPERS

			system can help solving traffic problems in busy cities to a great extent by saving a significant amount of man-hours that get lost waiting on jammed roads. This research focuses on factors, Low-cost image processing and traffic load balancing.
SMES-21	Wearable Sensor System for Multi-lead ECG Measurement		This work is concerned with the development of a Wireless low-power wearable system to be used for multi-lead ECG monitoring. Potential applications can range from sport and fitness to healthcare. The paper aims to present the architecture of the system and its performance, along with in vivo results achieved with carbon based smart textiles.
SMES-22	Prototyping of a Cost Effective and Portable Ventilator		Scripture under sight is defining the robustness and functionalities of ventilator which is not only easily transferable as well as it is very low cost and economics friendly. It is designed under the basic idea of being incorporated in huge human catastrophes in poorly resources enriched environments. Ventilator under the proposed design was being developed with wooden pieces with a weight of6 kg and has a volume of14 x 7 x 9 inches. It functions without human operator as it delivers breaths through the compression of an orthodox bag-valve mask. It satisfies its energy needs from an electric motor having battery power of 12 volts DC. Different functions need to be performed for the purpose of ventilation i.e. pressure and required number of breathes per minute is managed by an easy to use input board comprising of buttons. In addition to that it also contains an alarm of low battery indication system as well as an assist control. This proposed design of ventilator is made up of a cost of$150, but on a massive production it will result into cost benefits and it will be available at a price of $100. This

IEEE 2017 BASEPAPERS

			piece of prototype is cost effective as well as energy Efficient as far as the present technology in ventilators is concerned. It can be declared as a viable option based upon the above characteristics.
SMES-23	Respiratory and cardiac rates monitoring during MR examination by a sensorized smart textile		Wearable sensorized smart textile are gaining interests in medicine for monitoring physiological parameters. Moreover, sensing solutions based on fiber optic technologies Have shown promising results for applications in Magnetic Resonance (MR) environment. The aim of the present study was to evaluate the functionality of an MR-compatible smart textile based on six fiber Bragg grating (FBG) sensors inside the MR environment for the monitoring of both respiratory and cardiac activities during apnea and quiet breathing stages. The proposed textile was tested on two healthy volunteers undergoing 1.5 Tesla MR examinations. By analyzing the raw data collected by the six FBGs, respiratory parameters (i.e., respiratory rate, inspiratory and expiratory periods, inspiratory/respiratory ratio and inspiratory/expiratory ratio) have been computed. Thus, considering the raw data collected by the FBG sensor closest to the heart the resting heart rate was calculated by using the Fast Fourier transform (FFT). Results show that both the big displacements at low frequency (related to the breathing) and the small displacements at higher frequency (related to the heart activity) can be collected with the proposed system allowing the evaluation of both the respiratory and cardiac activities during quiet breathing and apnea without artifacts on images, providing useful information about patient Condition.

IEEE 2017 BASEPAPERS

SMES-24	Smart Wireless Headphone for Cardiovascular and Stress Monitoring		Wearable technology has become ubiquitous in Recent years due to the miniaturization of circuit electronics and advances in smart materials that can conform to the requirements posed by the human body, behavior and experience. Sensors of this type are found attached almost to every body Segment, capable of delivering signals even in harsh activity scenarios. The reliability and relevance of the physiological data retrieved by wearable's have yet to surpass the conventional Technologies in the healthcare system today. In this paper we present a small device incorporated inside an headphone set that continuously monitors the ECG, impedance and acceleration of the head. As opposed to most biometric sensors, ECG measurement relies on non-optical methods by capturing the electrical potential around the ear in both sides of the head, whereas impedance monitoring involves AC stimulation instead of DC, the latter commonly involved in skin galvanic Response estimation. Signal processing of impedance parameters is performed in situ using a fast variant of the Discrete Fourier Transform in order to save computational resources and power Expenditure from a microcontroller equipped with Bluetooth Low Energy. Applications that can benefit from this device include cardiovascular and stress level assessment of individuals for whom an hearable is a requirement for work or leisure.
SMES-25	The comparison of soil sensors for integrated creation of IOT based Wetting front detector (WFD) with an efficient irrigation system to support precision farming	2017	This study investigates a prototyping of integrated system of Internet of Things based Wetting front detector (IOT-WFD) which focuses on how to enhance the IOT based Wetting front detector design for smart irrigation system. The empirical study was conducted with 2 sensors type to detect the wetting fronts which are the Frequency Domain Reflectrometry sensor (FDR) and Resistor-based sensor (RB) integrated and design

IEEE 2017 BASEPAPERS

			with Low-cost WFD. The results of this study point toward the IOT-WFD as an appropriated technology providing real time wetting front information in soil positively for application in terms of agricultural water management, with precision agriculture and efficient irrigation domain with a related decision knowledge that matches with the technology trend and smart farmer requirements. Evidence of positive results of this prototyping summary has been provided.

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