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CONTROLLING AND MONITORING SMART ELECTRONIC DEVICES IN REMOTE LOCATIONS BY USING INTERNET

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ABSTRACT

Now day's mobile devices performs a wide variety of tasks. mobile centric devices will be used for various performance-intensive tasks to control various electronic devices .Mobile platform allows multi-device collaboration for the mobile users increasing expectations towards computing services. Several mobile products such as smart mobile devices provide mobile device-centric life experience to link and communicate with variety of devices. In the proposed system is designed by using ARM 32-bit micro controller which supports different features and algorithms for the development of complex time sharing system. In this work two boards are used which states User1 & User2 to receive data from two remote/mobile areas. Data is accessed from Mobiles or Laptop through some IP address and also monitored and control the devices from remote location from the web services. Data from User 1 receives User 2 processor and both the data will displays in remote location. The outputs are integrated from two different wireless technologies (Zigbee & Wi-Fi) into mobile platform to modernize the system in the form of server and cloud. Mobile platform allows multi-device collaboration for the mobile users increasing expectations towards computing services.

KEYWORDS: Mobile Devices; Zigbee; Wi-Fi; Multi-OS; Device-Centric; Uneven processor

INTRODUCTION

The performance improvement of various mobile computing devices such as smart phones, tablets etc. more and more users are taking these devices much like that they use their Personal Computers and expecting richer services provided in the premise of maintaining or even prolonging their battery lives. The inherent problems such as resource poverty, finite power supply and limited connectivity are still remained as the main obstacles to realize the mobile user experience improvement.Nowadays a number of paradigms such as mobile cloud computing ,cyber foraging, dynamic compostable computing , and slim execution etc, have been proposed to address these problems. The common principle in all the methods are collaborative computing based on offloading ,memory-intensive storage to external computing platforms. While keeping the processing capabilities the energy dissipations on the smart mobile devices are reduced substantially. Generally most of these solutions are just focusing on the collaboration implementation between smart mobile devices and more powerful computing platforms.

Some dumb devices, such as webcam, speaker, digital camera and etc, can be accessed by or can cooperate with smart mobile devices directly. However, most of the tasks are still undertaken by the smart mobile devices. For example, enjoying high-quality music on a low-tier speaker directly is impossible now. Because, to make this come true, the smart mobile device must transcode the music file to the format which the speaker support, and then stream the transcoded data to the speaker. Besides, although these dumb devices can be accessed by smart mobile devices directly, various device drivers and frequent software upgrading operations pose huge overload to the smart mobile devices. Several mobile products and services have been released by manufacturers to provide mobile device-centric life experience. In these solutions, smart mobile devices discover, connect and communicate with various devices.

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SYSTEM DESIGN

BLOCK DIAGRAM:

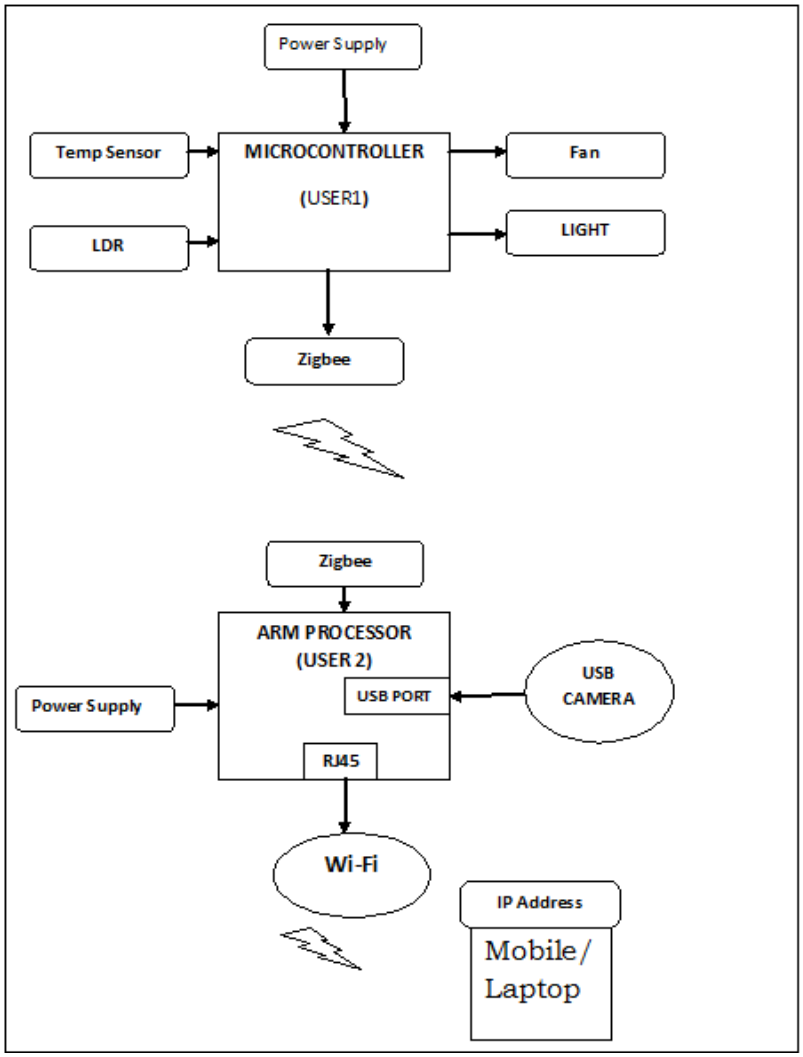

Fig 1: blockdiagram

Our system is designed by using ARM 32-bit micro controller which supports different features and algorithms for the development of complex time sharing systems. We are using two boards which states User1 & User2 to receive data from two remote/mobile areas. We will access those data from our Mobiles or Laptop through some IP address. Here we can monitor and control the devices from remote location nothing but from the web services. Based up on our requirement devices can operate through Mobiles/Laptops.Data from User 1 receives User 2 processor and both the data will displays in remote location. We are integrating two different wireless technologies (Zigbee & Wi-Fi) into one platform to modernize the system in the form of server and cloud. Many users can access the data without any interrupt by using Wi-Fi.

HARDWARE IMPLEMENTATION

A. Micro controller:

The AT89S52 is a low-power, high-performance CMOS 8-bit microcontroller with 8K bytes of in-system programmable Flash memory. The device is manufactured using Atmel's high-density nonvolatile memory technology and is compatible with the industry-standard 80C51 instruction set and pin out. The on-chip Flash allows

the program memory to be reprogrammed in-system or by a conventional nonvolatile memory programmer. By combining a versatile 8-bit CPU with in-system programmable Flash on a monolithic chip, the Atmel AT89S52 is a powerful microcontroller which provides a highly-flexible and cost-effective solution to many embedded control applications.

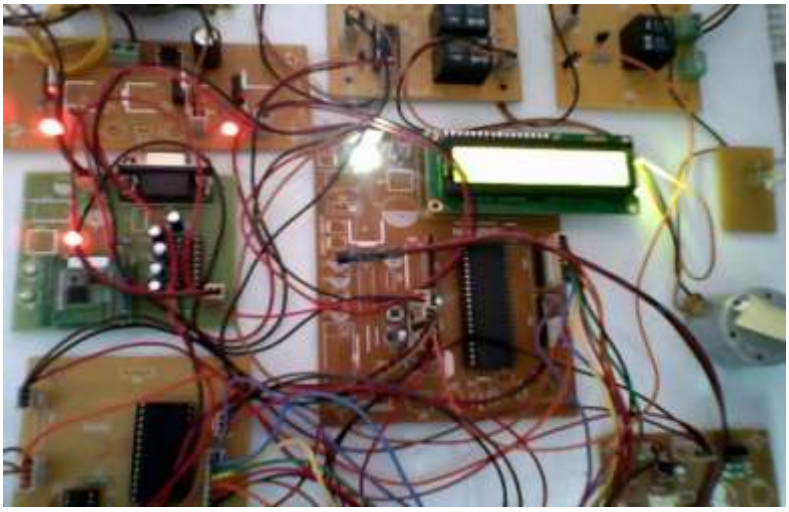

Fig2: sensor board

B. **Friendly Arm:**

The ARM is a 32-bit RISC processor architecture developed by the ARM Corporation. ARM processors possess a unique combination of features that makes ARM the most popular embedded architecture today. First, ARM cores are very simple compared to most other general-purpose processors, which means that they can be manufactured using a comparatively small number of transistors, leaving plenty of space on the chip for application specific macro cells.

Fig3: Friendly Arm

Advanced RISC Machine (ARM) featuring the Mini2440 SBC with Samsung's S3C2440 ARM9 processor clocked at 400MHz (533MHz Max). This board is equipped with 64MB of SDRAM, 2M of NOR Flash with BIOS, 64MB of NAND Flash memory. The Mini2440 board is paired with a 3.5" TFT 4-wire resistive touch screen. Comes pre-loaded with Linux QT (touch screen enabled). This 32-bit ARM9 system can support Android, Linux 2.6 and Windows CE 5/6. The system makes use embedded board which makes use of less power consumptive and advanced micro controller like **S3C2440**. **S3C2440** is a Samsung company's microcontroller which is designed based on the structure of ARM 920T family. This microcontroller works for a voltage of **+3.3V DC** and at an operating frequency of **400 MHz.**

The maximum frequency up to which this micro controller can work is **533 MHz.** We cannot get **S3C2440** microcontroller individually. We will get it in the form of FRIENDLY **ARM board** otherwise we can call it as

MINI 2440 board.Our ARM board comes with an integrated peripherals like USB, Serial etc.On this board we are installing Linux operating system with necessary drivers for all peripheral devices and user level software stack which includes a light weight GUI based on XServer, V4L2 API for interacting with video devices like cameras, TCP/IP stack to communicate with network devices and some standard system libraries for system level general IO operations. In this Door Phone Embedded System , we connect USB camera for face recognition process. And for voice recognition we use mic which is built in Friendly arm board. GSM modem is connected to one of the UART port of the ARM architectured device.

C. Zigbee:

ZigBee is a low-cost, low-power, wireless mesh networking proprietary standard. The low cost allows the technology to be widely deployed in wireless control and monitoring applications, the low power-usage allows longer life with smaller batteries, and the mesh networking provides high reliability and larger range. The protocols build on recent algorithmic research (Ad-hoc On-demand Distance Vector, neuRFon) to automatically construct a low-speed ad-hoc network of nodes. In most large network instances, the network will be a cluster of clusters. It can also form a mesh or a single cluster. The current profiles derived from the ZigBee protocols support beacon and non-beacon enabled networks.

Fig4: zigbee

D. Wi-Fi :

Wi-Fi, also spelled Wifi or WiFi, is a local area wireless technology that allows an electronic device to exchange data or connect to the internet using 2.4 GHzUHF and 5 GHz SHF radio waves. These can connect to a network resource such as the Internet via a wireless network access point. Such an access point (or hotspot) has a range of about 20 meters (66 feet) indoors and a greater range outdoors. Hotspot coverage can comprise an area as small as a single room with walls that block radio waves, or as large as many square kilometres achieved by using multiple overlapping access points.

E . TEMPERATURE SENSOR:

The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The LM35 thus has an advantage over linear temperature sensors calibrated in ° Kelvin.The LM35's low output impedance, linear output, and precise inherent calibration make interfacing to readout or control circuitry especially easy. It can be used with single power supplies, or with plus and minus supplies. As it draws only 60 µA from its supply, it has very low self-heating, less than 0.1°C in still air. The LM35 is rated to operate over a -55° to +150°C temperature range.

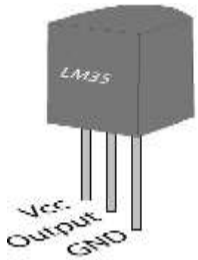

Fig5: LM 35 Temperature sensor

F. UVC driver

A UVC (or Universal Video Class) driver is a USB-category driver. A driver enables a device, such as your webcam, to communicate with your computer's operating system and USB (or Universal Serial Bus) is a common type of connection that allows for high-speed data transfer. Devices that are equipped with a UVC driver, such as the Logitech® Quick Cam® Pro 9000 for Business, are capable of streaming video[8]. It is the UVC driver that enables the webcam to be plug and play. A webcam with a UVC driver does not need any additional software to work. Once you plug your webcam in, it can work with a video-calling application, such as Skype®, Windows Live Messenger®, or Microsoft Office® Communicator.

G. Light Dependent Resistor

Light dependent resistors are used to re-charge a light during different changes in the light, or they are made to turn a light on during certain changes in lights. One of the most common uses for light dependent resistors is in traffic lights. The light dependent resistor controls a built in heater inside the traffic light, and causes it to recharge over night so that the light never dies[10]. Other common places to find light dependent resistors are in: infrared detectors, clocks and security alarms. The main purpose of a light dependent resistor is to change the brightness of a light in different weather conditions.

Fig 6: LDR

SOFTWARE IMPLEMENTATION

For implementing this project we are using Linux, Qt for embedded Linux and open CV library.

1. Linux Operating System

The Linux open source operating system, or Linux OS, is a freely distributable, cross-platform operating system based on Unix that can be installed on PCs, laptops, net books, mobile and tablet devices, video game consoles, servers, supercomputers and more.

2. Qt for Embedded Linux

Qt for Embedded Linux is a C++ framework for GUI and application development for embedded devices. It runs on a variety of processors, usually with Embedded Linux. Qt for Embedded Linux provides the standard Qt API for embedded devices with a lightweight window system.

3. OPEN CV

Open CV is an open source computer vision library originally developed by Intel. It is free for commercial and research use under a BSD (Berkeley Software Distribution) license. The library is cross-platform, and runs on Linux, Windows and Mac OS X. It focuses mainly towards real-time image processing, as such, if it finds Intel's Integrated Performance Primitives on the system, it will use these commercial optimized routines to accelerate itself.

WORKING MECHANISM

The system makes use embedded board which makes use of less power consumptive and advanced micro controller like S3C2440. S3C2440 is a Samsung company's microcontroller which is designed based on the structure of ARM 920T family. This microcontroller works for a voltage .of +3.3V DC and at an operating frequency of 400 MHz, The maximum frequency up to which this micro controller can work is 533 MHz. We cannot get S3C2440 microcontroller individually. We will get it in the form of friendly arm board otherwise we can call it as mini 2440 board. Our ARM board comes with an integrated peripherals like USB, Serial etc .On this board we are installing Linux operating system with necessary drivers for all peripheral devices and user level software stack which includes a light weight GUI based on XServer, V4L2 API for interacting with video devices like cameras, TCP/IP stack to communicate with network devices and some standard system libraries for system level general IO operations. In this Door Phone Embedded System , we connect USB camera for face recognition process. And for voice recognition we use mic which is built in Friendly arm board. GSM modem is connected to one of the UART port of the ARM architectured device.

After connecting all the devices then power up the device. When the device starts booting from flash, it first load the linux to the device and initialize all the drivers and the core kernel. After initialization of the kernel it first check whether all the devices are working properly or not. After that it loads the file system and start the startup scripts for running necessary processes and daemons. Finally it starts the main application.When our application starts running it first check all the devices and resources which it needs are available or not. After that it check the connection with the devices and gives control to the user. The GUI for the user has the following options.

- An optional label is displayed which gives streaming video.
- A combo box is available for person ids(names) and capture button for capturing the faces. Add and Discard buttons avail for adding captured data to internal database as well as discarding unwanted images

RESULTS

In the proposed system User2 receives the data from User1 and access those data access from mobiles/laptop through some ip address. In On recognition mode, when that person enters or touches the screen automatically it will be recognized by comparing the detected word with database and the same word will be pronounced. In Fig9 and fig10 we can controlling and monitoring the smart devices from friendly arm board.

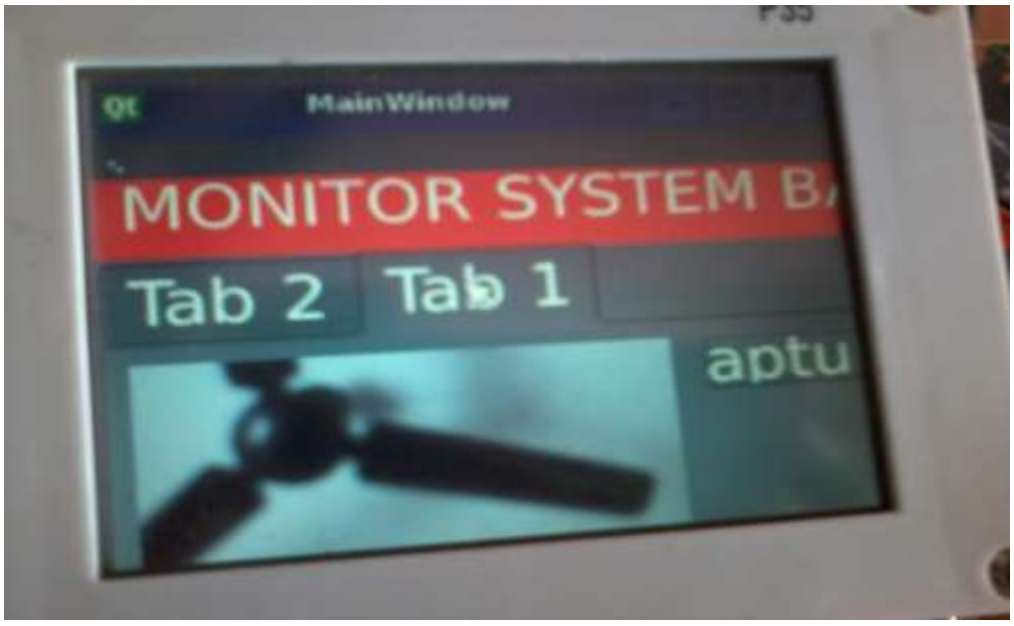

Fig 7: Circuit with monitoring of user2 by USB Camera

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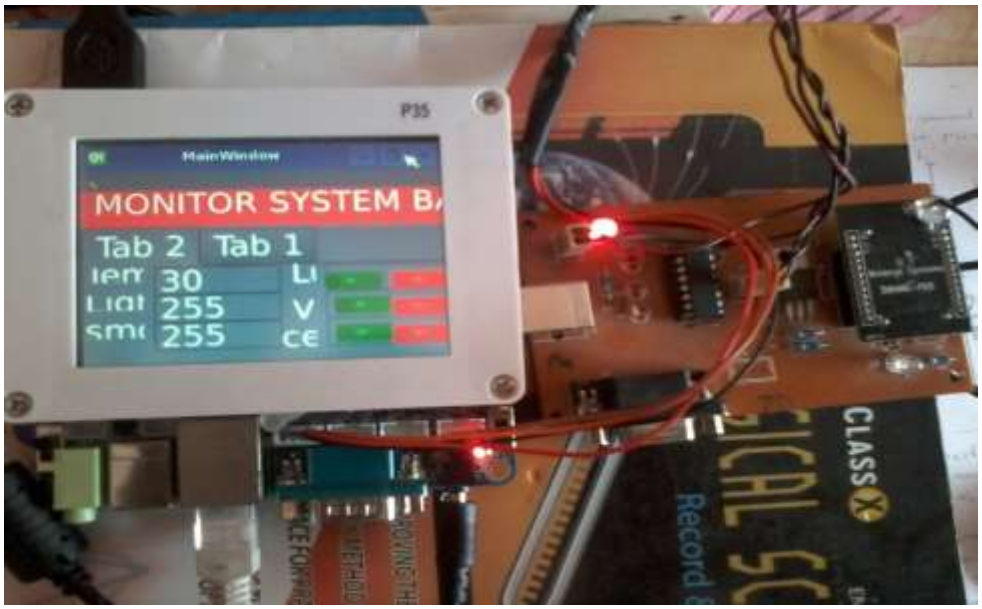

Fig 8: monitored and controlled devices in arm

From the sensor board we are sending monitored values to control room (ARM board) through Zigbee wireless area network. Wireless environmental system monitors the conditions by Temperature sensor also whenever environmental conditions are differed automatically sensor data will be modified and send it to controller. From the laptop or Wi-Fi enabled devices monitored sensor data can be retrieved by typing specific IP address from the browser. In this way we can monitor the environmental conditions with wireless technology. those data we can observe the fig9.

Fig 9: Controlling Menu of Smart devices in monitor.

When that person enters or touches the screen automatically it will be recognized by comparing the detected word with database and the same word will be pronounced. From the above figure shows we can Controlling and monitoring the Smart devices in monitor.

From the figure.10 we can controlling the two devices in remote places by using web server. when that person enters or touches the screen automatically it will be recognized by comparing the detected word with database

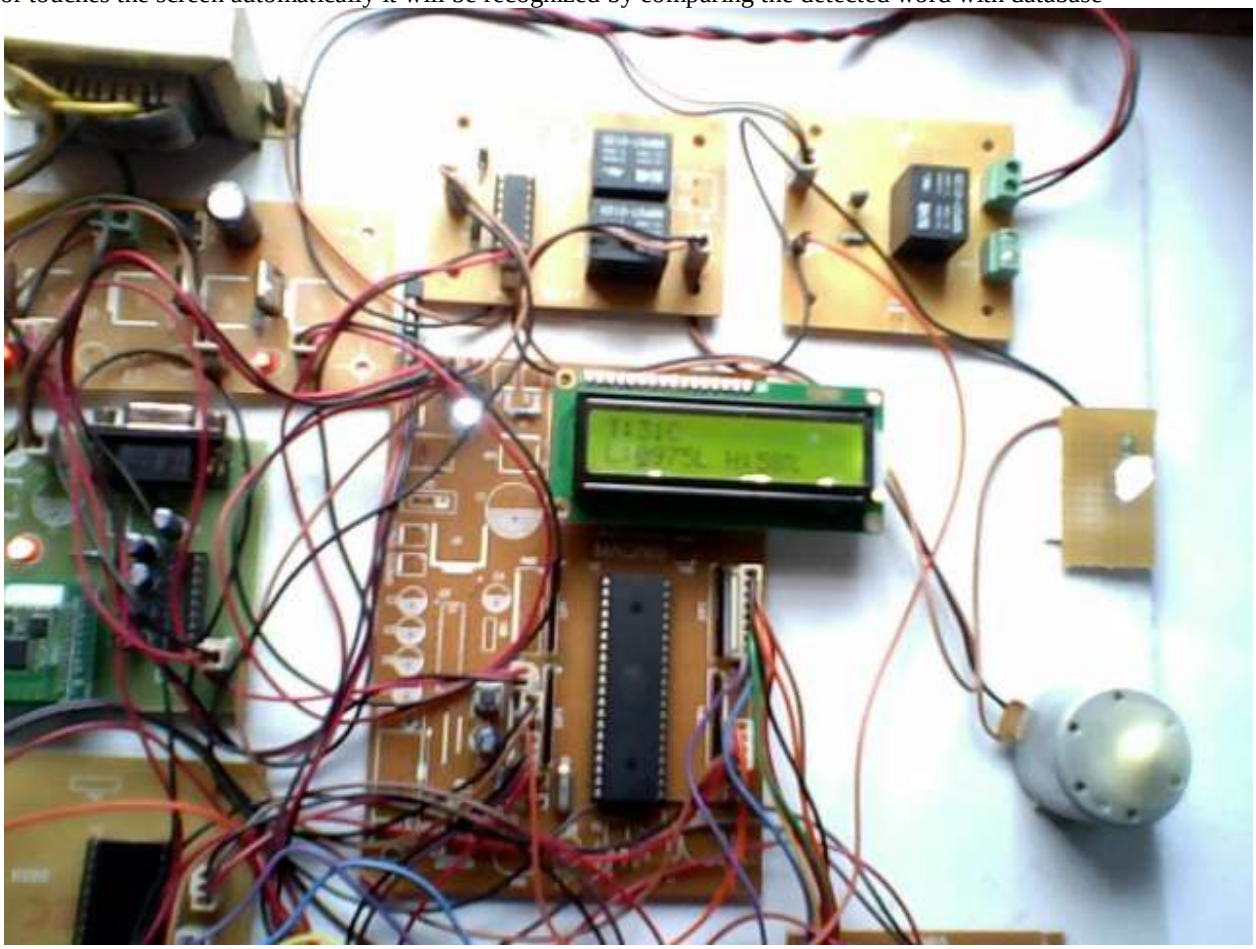

Fig 10: Controlling the smart devices in sensor board

CONCLUSION

A universal mobile platform is proposed to make existing smart devices collaboration .The system has been successfully designed and tested. It also developed by integrating features of all the hardware components and software used. with the proposed system deployed, smart objects with additional processing power and wireless connectivity brought in. These newly formed smart objects can cooperate with existing smart mobile devices and a series of techniques ranging from hardware, software to middleware are proposed. Uneven-dual-core based processor provides quick boot time while keeping a very low system power consumption. In the proposed system based mobile computing platform smart mobile devices are released from the high computations and are federated into a unified platform to enable more innovative mobile application. In this system monitoring and controlling devices based on embedded web server replaces the pc web server. The user can monitor and control the devices through web technology. The system has low cost, portability and is easy to upgrade and maintain. This system can be applicable in educational institutes, industries etc. It is concluded that the system can be connected to internet for monitoring and controlling devices.

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