SMART EVM USING RASPBERRY PI WITH FACE RECOGNITION AND FINGER PRINT SENSOR

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ABSTRACT

It is to eliminate the fraudulent votes that are happening during the election procedure and to provide a highly secured data transfer to IOT which produces results, whether who is in the lead after polling is completed and results will be declared instantly with the help of this smart EVM system. Initially one has to verify their biometrics and they are allowed to vote in election. The basic idea of this project is to create an electronic voting machine that will help to eradicate frauding of the manual voting system and prior versions of electronic voting by using Raspberry Pi. Here proposes a system that include multiple layers of verification to ensure the liability of the device which include the fingerprint verification and facial recognition. Each voter is entered in to the polling booth only after recognized and checked with the given data base of enlisted voters, once the corresponding finger print and face is matched with the information provided, the voter will be allowed to proceed for choosing their preferred candidate from the panel of buttons. The final vote is then displayed on the monitor for the satisfaction of voters. The proposed project displays transparency and also carries the feature of being autonomous during the course of operation.

1. INTRODUCTION

An embedded system is some combination of computer hardware and software, either fixed in capability or programmable, that is specifically designed for a particular kind of

application device. Industrial machines, automobiles, medical equipment, cameras, household appliances, airplanes, vending machines, and toys (as well as the more obvious cellular phone and PDA) are among the myriad possible hosts of an embedded system. Embedded systems are programmable are provided with a programming interface, and embedded systems programming is a specialized occupation. Certain operating systems or language platforms are tailored for the embedded market, such as Embedded Java and Windows XP Embedded. However, some low end consumer products use every in expensive microprocessors and limited storage, with the application and operating system both part of a single program.

The program is written permanently into the system's memory in this case, rather than being loaded into RAM (random access memory), as programs are in a personal computer.

1.1 INTRODUCTION OF EMBEDDED SYSTEM:

An Embedded System is a combination of computer hardware and software, and perhaps additional mechanical or other parts, designed to perform a specific function. A good example is the microwave oven.

Almost every household has one, and tens of millions of them are used every day, but very few people realize that a processor and software are involved in the preparation of their lunch or dinner.

This is in direct contrast to the personal computer in the family room. It is comprised of computer hardware and software and mechanical components (disk drives, for example). However, a personal computer is not designed to perform a specific function rather; it is able to do many different things. Many people use the term general-purpose computer to make this distinction clear. As shipped, a generalpurpose computer is a blank slate; the manufacturer does not know what the customer will do wish it. One customer may use it for a network file server another may use it exclusively for playing games, and a third may use it to write the next great American novel. 2 Frequently, an embedded system is a component within some larger system. For example, modern cars and trucks contain many embedded systems. One embedded system controls the antilock brakes, other monitors and controls the vehicle's emissions, and a third displays information on the dashboard. In some cases, these embedded systems are connected by some sort of a communication network, but that is certainly not a

requirement. At the possible risk of confusing you, it is important to point out that a generalpurpose computer is itself made up of numerous embedded systems. For example, my computer consists of a keyboard, mouse, video card, modem, hard drive, floppy drive, and sound card-each of Which is an embedded system? Each of these devices contains a processor and software and is designed to perform a specific function. For example, the modem is designed to send and receive digital data over analog telephone line. That's it and all of the other devices can be summarized in a single sentence as well. If an embedded system is designed well, the existence of the processor and software could be completely unnoticed by the user of the device. Such is the case for a microwave oven, VCR, or alarm clock. In some cases, it would even be possible to build an equivalent device that does not contain the processor and software. This could be done by replacing the combination with a custom integrated circuit that performs the same functions in hardware. However, a lot of flexibility is lost when a design is hard-cooled in this way. It is mush easier, and cheaper, to change a few lines of software than to redesign a piece of custom hardware.

1.2 HISTORY AND FUTURE:

Given the definition of embedded systems earlier is this chapter; the first such systems could not possibly have appeared before 1971. That was the year Intel introduced the world's first microprocessor. This chip, the 4004, was designed for use in a line of business calculators produced by the Japanese Company Busicom. In 1969, Busicom asked Intel to design a set of custom integrated circuits-one for each of their new calculator models. The 4004 was Intel's response rather than design custom hardware for each calculator, Intel proposed a general-purpose circuit that could be used throughout the entire line of calculators. Intel's idea was that the software would give each calculator its unique set of features.

The microcontroller was an overnight success, and its use increased steadily over the next decade. Early embedded applications included unmanned space probes, 3 computerized traffic lights, and aircraft flight control systems. In the 1980s, embedded systems quietly rode the waves of the microcomputer age and brought microprocessors into every part of our kitchens (bread machines, food processors, and microwave ovens), living rooms (televisions, stereos, and remote controls), and workplaces (fax machines, pagers, laser printers, cash registers, and credit card

readers). It seems inevitable hat the number of embedded systems will continue to increase rapidly. Already there are promising new embedded devices that have enormous market potential; light switches and thermostats that can be central computer, intelligent air-bag systems that don't inflate when children or small adults are present, pal-sized electronic organizers and personal digital assistants (PDAs), digital cameras, and dashboard navigation systems. Clearly, individuals who possess the skills and desire to design the next generation of embedded systems will be in demand for quite some time.

1.3 REAL TIME SYSTEMS:

One subclass of embedded is worthy of an introduction at this point. As commonly defined, a real-time system is a computer system that has timing constraints. In other words, a real-time system is partly specified in terms of its ability to make certain calculations or decisions in a timely manner. These important calculations are said to have deadlines for completion. And, for all practical purposes, a missed deadline is just as bad as a wrong answer. The issue of what if a deadline is missed is a crucial one. For example, if the real-time system is part of an airplane's flight control system, it is possible

for the lives of the passengers and crew to be endangered by a single missed deadline. However, if instead the system is involved in satellite communication, the damage could be limited to a single corrupt data packet. The more severe the consequences, the more likely it will be said that the deadline is "hard" and thus, the system is a hard real-time system. Real-time systems at the other end of this discussion are said to have "soft" deadlines. All of the topics and examples presented in this book are applicable to the designers of real time system who is more delight in his work. He must guarantee reliable operation of the software and hardware under all the possible conditions and to the degree that human lives depend upon three system's proper execution, engineering calculations and descriptive paperwork.

Application Areas : Nearly 99 per cent of the processors manufactured end up in embedded systems. The embedded system market is one of the highest growth areas as these systems are used in very market segment- consumer electronics, office automation, industrial automation, biomedical engineering, wireless communication, Data communication, telecommunications, transportation, military and so on.

Consumer appliances: At home we use a number of embedded systems which include digital camera, digital diary, DVD player, electronic toys, microwave oven, remote controls for TV and air conditioner, VCO player, video game consoles, video recorders etc. Today's high-tech car has about 20 embedded systems for transmission control, engine spark control, air-conditioning, navigation etc. Even wristwatches are now becoming embedded systems. The palmtops are powerful embedded systems using which we can carry out many general-purpose tasks such as playing games and word processing.

Office automation: The office automation products using em embedded systems are copying machine, fax machine, key telephone, modem, printer, scanner etc.

Industrial automation: Today a lot of industries use embedded systems for process control. These include pharmaceutical, cement, sugar, oil exploration, nuclear energy, electricity generation and transmission. The embedded systems for industrial use are designed to carry out specific tasks such as monitoring the temperature, pressure, humidity, voltage, current etc., and then take appropriate action based on the monitored levels to control

other devices or to send information to a centralized monitoring station. In hazardous industrial environment, where human presence has to be avoided, robots are used, which are programmed to do specific jobs. The robots are now becoming very powerful and carry out many interesting and complicated tasks such as hardware assembly.

Medical electronics: Almost every medical equipment in the hospital is an embedded system. These equipments include diagnostic aids such as ECG, EEG, blood pressure measuring devices, X-ray scanners; equipment used in blood analysis, radiation, colonoscopy, endoscopy etc. Developments in medical electronics have paved way for more accurate diagnosis of diseases.

Computer networking: Computer networking products such as bridges, routers, Integrated Services Digital Networks (ISDN), Asynchronous Transfer Mode (ATM), X.25 and frame relay switches are embedded systems which implement the necessary data communication protocols. For example, a router interconnects two networks. The two networks may be running different protocol stacks. The router's function is to obtain the data packets from incoming pores, analyze

the packets and send them towards the destination after doing necessary protocol conversion. Most networking equipments, other than the end systems (desktop computers) we use to access the networks, are embedded systems.

Telecommunications: In the field of telecommunications, the embedded systems can be categorized as subscriber terminals and network equipment. The subscriber terminals such as key telephones, ISDN phones, terminal adapters, web cameras are embedded systems. The networkequipment includes multiplexers, multiple access systems, Packet Assemblers Dissemblers (PADs), sate11ite modems etc. IP phone, IP gateway, IP gatekeeper etc. are the latest embedded systems that provide very low-cost voice communication over the Internet.

Wireless technologies: Advances in mobile communications are paving way for many interesting applications using embedded systems. The mobile phone is one of the marvels of the last decade of the 20'h century. It is a very powerful embedded system that provides voice communication while we are on the move. The Personal Digital Assistants and the palmtops can now be used to access multimedia services over the Internet. Mobile communication

infrastructure such as base station controllers, mobile switching centers are also powerful embedded systems.

Insemination: Testing and measurement are the fundamental requirements in all scientific and engineering activities. The measuring equipment we use in laboratories to measure parameters such as weight, temperature, pressure, humidity, voltage, current etc. are all embedded systems. Test equipment such as oscilloscope, spectrum analyzer, logic analyzer, protocol analyzer, radio communication test set etc. are embedded systems built around powerful processors. Thank to miniaturization, the test and measuring equipment are now becoming portable facilitating easy testing and measurement in the field by field-personnel. 6

Security: Security of persons and information has always been a major issue. We need to protect our homes and offices; and also the information we transmit and store. Developing embedded systems for security applications is one of the most lucrative businesses nowadays. Security devices at homes, offices, airports etc. for authentication and verification are embedded systems. Encryption devices are nearly 99 per cent of the processors that are

manufactured end up in~ embedded systems. Embedded systems find applications in. every industrial segment- consumer electronics, transportation, avionics, biomedical engineering, manufacturing, process control and industrial automation, data communication, telecommunication, defense, security etc. Used to encrypt the data/voice being transmitted on communication links such as telephone lines.Biometric systems using fingerprint and face recognition are now being extensively used for user authentication in banking applications as well as for access control in high security buildings.

Finance: Financial dealing through cash and cheques are now slowly paving way for transactions using smart cards and ATM (Automatic Teller Machine, also expanded as Any Time Money) machines. Smart card, of the size of a credit card, has a small microcontroller and memory; and it interacts with the smart card reader! ATM machine and acts as an electronic wallet. Smart card technology has the capability of ushering in a cashless society. Well, the list goes on. It is no exaggeration to say that eyes wherever you go, you can see, or at least feel, the work of an embedded system.

1.4 OVERVIEW OF EMBEDDED SYSTEM ARCHITECTURE

Every embedded system consists of custom-built hardware built around a Central Processing Unit (CPU). This hardware also contains memory chips onto which the software is loaded. The software residing on the memory chip is also called the 'firmware'. The embedded system architecture can be represented as a layered architecture as shown in Fig. The operating system runs above the hardware, and the application software runs above the operating system. The same architecture is applicable to any computer including a desktop computer. However, there are significant differences. It is not compulsory to have an operating system in every embedded system. For small appliances such as remote control units, air conditioners, toys etc., there is no need for an operating system and you can write only the software specific to that 7 application. For applications involving complex processing, it is advisable to have an operating system. In such a case, you need to integrate the application software with the operating system and then transfer the entire software on to the memory chip. Once the software is transferred to the memory chip, the software

will continue to run fora long time you don't need to reload new software.

Now, let us see the details of the various building blocks of the hardware of an embedded system. As shown in Fig. the building blocks are:

• Central Processing Unit (CPU)

• Memory (Read-only Memory and Random Access Memory)

• Input Devices

• Output devices

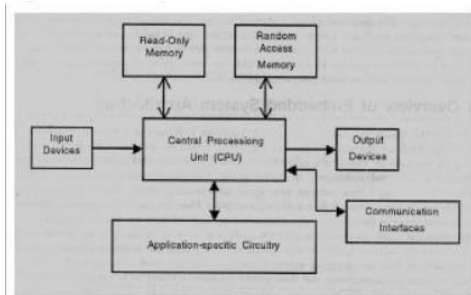• Communication interfaces

• Application-specific circuitry

Fig. 1: Blocks of hardware embedded system

Central Processing Unit (CPU): The Central Processing Unit (processor, in short) can be any of the following: microcontroller, microprocessor or Digital Signal Processor (DSP). A micro-controller is a low-cost processor. Its main attraction is that on the chip itself, there will be many other components such as memory, serial communication interface, analog-to digital converter etc. So, for small applications, a micro-controller is the best choice as the number of external components required will be very less. On the other hand, microprocessors are more powerful, but you need to use many external components with them. D5P is used mainly for applications in which signal processing is involved such as audio and video processing.

Memory: The memory is categorized as Random Access 11emory (RAM) and Read Only Memory (ROM). The contents of the RAM will be erased if power is switched off to the chip, whereas ROM retains the contents even if the power is switched off. So, the firmware is stored in the ROM. When power is switched on, the processor reads the ROM; the program is program is executed.

Input devices: Unlike the desktops, the input devices to an embedded system have very limited capability. There will be no keyboard or a mouse, and hence interacting with the embedded system is no easy task. Many embedded systems will have a small keypad-you press one key to give a specific command. A keypad may be used to input

only the digits. Many embedded systems used in process control do not have any input device foruser interaction; they take inputs from sensors or transducers 1'fnd produce electrical signals that are in turn fed to other systems.

Output devices: The output devices of the embedded systems also have very limited capability. Some embedded systems will have a few Light Emitting Diodes (LEDs) to indicate the health status of the system modules, or for visual indication of alarms. A small Liquid Crystal Display (LCD) may also be used to display some important parameters.

Communication interfaces: The embedded systems may need to, interact with other embedded systems at they may have to transmit data to a desktop. To facilitate this, the embedded systems are provided with one or a few communication interfaces such as RS232, RS422, RS485, Universal Serial Bus (USB), IEEE 1394, Ethernet etc.

2.BLOCK DIAGRAM

2.1 BLOCK DIAGRAM
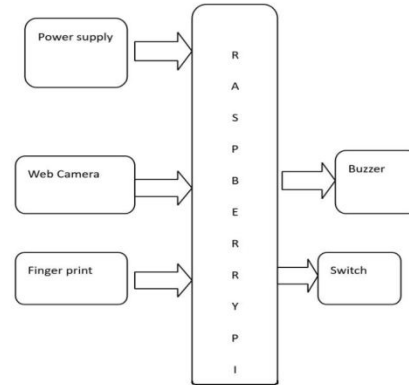
2.2 POWER SUPPLY BLOCKDIAGRAM:

3. DESCRIPTION OF COMPONENTS
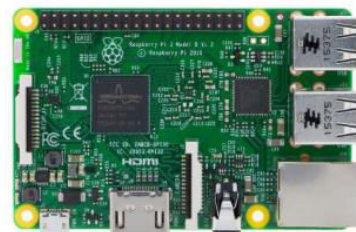
3.1 Raspberry Pi Board:


Fig 3.1 Raspberry Pi Board

3.1.1 Bcm2837 Features

A Raspberry Pi 4 board contains BCM2837 controller which supports ARM11 processing unit. This is the Broadcom chip used in the Raspberry Pi 4, and in later models of the Raspberry Pi 2. The

underlying architecture of the BCM2837 is identical to the BCM2836. The only significant difference is the replacement of the ARMv7 quad core cluster with a quad-core ARM Cortex A53 (ARMv8) cluster. The ARM cores run at 1.2GHz, making the device about 50% faster than the Raspberry Pi 2. The VideocoreIV runs at 400Mhz. The Raspberry Pi 3 Model B builds upon the features of its predecessors with a new, faster processor on board to increase its speed. It also features WiFi and Bluetooth Low Energy capabilities to enhance the functionality and the ability to power more powerful devices over the USB ports [20].

3.2. POWER SUPPLY

The input to the circuit is applied from the regulated power supply. The a.c. input i.e., 230V from the mains supply is step down by the transformer to 12V and is fed to a rectifier. The output obtained from the rectifier is a pulsating d.c voltage. So in order to get a pure d.c voltage, the output voltage from the rectifier is fed to a filter to remove any a.c components present even after rectification. Now, this voltage is given to a voltage regulator to obtain a pure constant dc voltage.
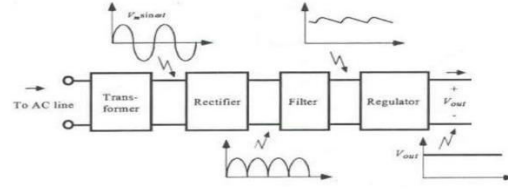
3.2 Block Diagram of Power supply

3.3 USB CAMERA

Camera plays a vital role in automation purpose. The camera is used for monitoring of a room from a remote place. The camera used is a USB camera (life cam vx-800). Whenever the user clicks on to video button on loaded webpage, the corresponding room video will be streamed on to webpage .For this purpose we use a MJPG streamer. The below figure shows the camera that has been used for monitoring of a room

Fig 3.3 USB CAMERA

3.4 FINGER PRINT FINGERPRINT SENSOR

The fingerprint sensor can read different fingerprints and store in its own flash memory. The sensor can perform three

functions namely Add (Enroll), Empty Database or search database and return the ID of stored fingerprint. Any of three functions can be called simply by making the pin low of the sensor or pressing onboard 18 three switches. The response is either error or ok which is indicated by onboard LED. The response is also returned as single serial data byte. The return byte is a valid ID or error code. The response byte is a single byte at 9600 bps thus making whole sensor very easy to use. We have provided indicating LEDs and function switch already so it's ready to use when you receive it. Just give power and start using the sensor using onboard switches. Then you can move on making external application using these functions. Inputs and Outputs of Sensor

Live scan devices

Fingerprint being scanned

3D fingerprint [12]

The procedure for capturing a fingerprint using a sensor consists of rolling or touching with the finger onto a sensing area, which according to the physical principle in use (optical, ultrasonic, capacitive, or thermal) captures the difference between valleys and ridges. When a finger touches or rolls onto a surface, the elastic skin deforms.

3.5 SWITCH

a switch is an electrical component that can disconnect or connect the conducting path in an electrical circuit, interrupting the electric current or diverting it from one 26 conductor to another.[1][2] The most common type of switch is an electromechanical device consisting of one or more sets of movable electrical contacts connected to external circuits. When a pair of contacts is touching current can pass between them, while when the contacts are separated no current can flow.

3.6 IOT (INTERNET OF THINGS)

The IOT concept was coined by a member of the Radio Frequency Identification (RFID) development community in 1999, and it has recently become more relevant to the practical world largely because of the growth of mobile devices, embedded and ubiquitous communication, cloud computing and data analytics. Imagine a world where billions of objects can sense, communicate and share information, all interconnected over public or private Internet Protocol (IP) networks. These interconnected objects have data regularly collected, analysed and used to initiate action, providing a wealth of intelligence for planning, management and decision making. This is the world of the Internet of Things (IOT).
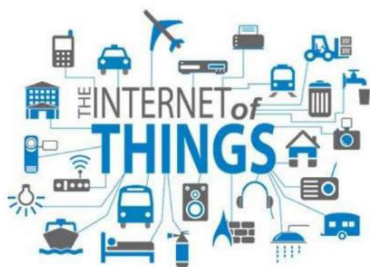
3.6.1 ENABLING TECHNOLOGIES FOR IOT

Internet of things (IoT) is a global infrastructure for the information society, enabling advanced services by interconnecting (physical and virtual) things

based on existing and evolving interoperable information and communication technologies. With the Internet of Things the communication is extended via Internet to all the things that surround us. The Internet of Things is much more than machine to machine communication, wireless sensor networks, sensor networks , 2G/3G/4G,GSM,GPRS,RFID, WI-FI, GPS, microcontroller, microprocessor etc.
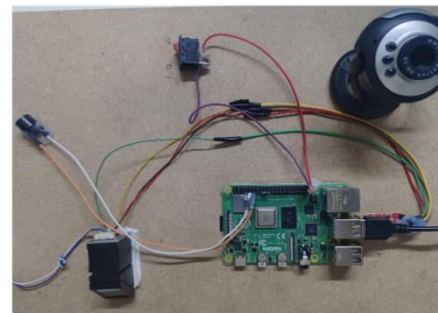
4. OUTPUT RESULT
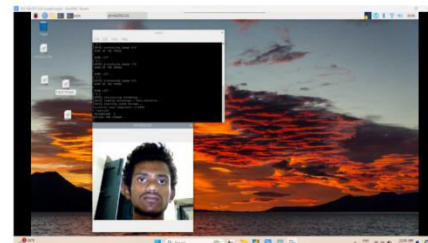

Fig. 1: Smart EVM circuit kit
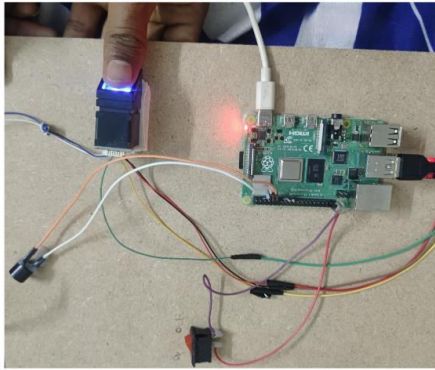

Fig. 2: Scanning the face
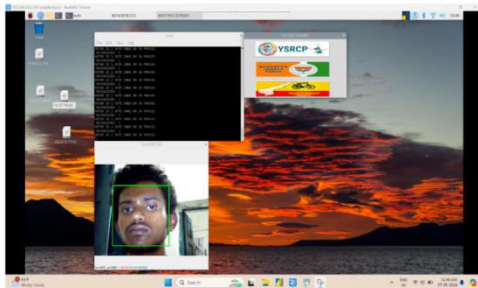
Fig. 3: scanning the fingerprint
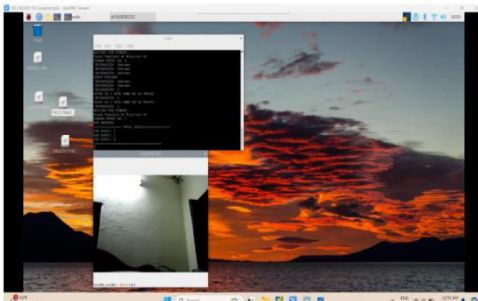

Fig. 4: Giving vote

Fig. 5: End Result

5. CONCLUSION

This proposed work is related to biometric system considering a right to vote from anywhere system which enables the elector to compute their vote from any place in India by using this biometric system based

electronic voting machine using raspberry pi which provides the secure way of voting where a person cannot vote more than once where we consider fingerprint &face recongnition system for the security purpose defrauduluence is avoided by using this system and high accuracy, time is saved and fair voting process is been carried out. 49

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