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Analysis Between Embedded Systems and Information Appliances

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Abstract
The prominence of embedded technologies in the consumer electronics sector and advancements in embedded technology in the consumer electronics sector Application of embedded systems in the washing machine, with emphasis on the harmonious operation of sensors, actuators, and the microcontroller unit, with special reference to hardware and design specifications, as well as an algorithm for error-free system operation. Embedded systems present a few inherent challenges and difficulties that require special attention from developers and Original Equipment Manufacturers (OEMs).Embedded systems are not only one of the most important fields for today's computer-based applications; they are also one of the most difficult fields of software engineering to master: embedded systems must meet real-time requirements, are safety critical, and are distributed across multiple processors. Embedded systems are used in a wide range of applications, including automobiles and mobile phones, as well as washing machines and printers. Nowadays, it's difficult to imagine our lives without them.Because of the increasing complexity and real-time requirements, new modelling techniques and formal methods must be used. The world of embedded systems is a fantastical realm of infinite possibilities. Imagine controlling all of the systems around you with a single gesture and having everything respond to you as if by magic. This may be possible with embedded systems.

Keyword
Real time, embedded system, Information Appliances, IOT, Original Equipment Manufacturers, system operation.

I. Introduction

The term embedded refers to a circuit built into the system, and the term system specifies how a task must be completed. These systems, which are generally based on real-time computing, are known as real-time operating systems (RTOS). An embedded system has a distinct personality and behaviour due to specialised hardware and software.

Embedded systems are typically written in a high-level language, which is then compiled (and/or assembled) into executable ("machine") code. These are stored in Read Only Memory (ROM) and are referred to as "firmware," "microcode," or "microkernel." The microprocessor can be 8-bit or 16-bit in size. The amount of memory accessed by the processor is denoted by the bit size. Typically, there is no operating system and only 0.5k of RAM. Normally, no priorities are assigned to the functions that are implemented. As the need for features grows and/or the need to establish priorities arises, it becomes increasingly important for the embedded system to include some sort of decision making mechanism. The most advanced systems actually run the show on a tiny, streamlined OS that runs on a 32-bit or 64-bit processor. This is known as RTOS. [1]

As microprocessors become smaller and more affordable, an increasing number of devices become'smart,' thanks to microprocessors embedded in them. ATMs, multifunction wristwatches, PDAs, PLCs, medical appliances, and many other applications are examples of embedded systems. In addition to the host and target systems, embedded software necessitates the use of software tools such as a cross compiler, cross assembler, linker, and locator. The applications of this technology range from household appliances to communication devices. [2]As the world undergoes unprecedented hardware research (nano-technology, quantum physics, etc.), packing more power into a single chip will soon become a reality. As a result, embedded systems could be described as a dreamer's paradise with limitless potential. An embedded computer, also known as an embedded system, is a computer system that consists of a computer processor, computer memory, and input/output peripheral devices that can be dedicated to function within another or larger system, such as mechanical or electrical systems, or that can operate independently. It is embedded as part of a complete device, which frequently includes electrical or electronic hardware as well as mechanical parts. [3]

The information chain is made up of four components: information acquisition, information processing, information transmission, and information application. When compared to the other three technologies, information acquisition has lagged far behind and is becoming a bottleneck for the time's rapid development.

Embedded systems have been successfully applied in industrial automation, communication systems, wireless communication, the Internet, consumer electronics, and other fields that have a close relationship with information processing, transmission, and application. It is the result of the development of the information chain's back-end link, and if used in information acquisition, it should produce sound effects. [4]

Purpose of embedded systems

Embedded systems are occasionally used as controllers to control a specific function within a device. Although more advanced embedded systems may control entire operating systems, they are typically designed to perform this function only once. Some more complex embedded systems can also perform multiple tasks, though they are still very simple tasks that do not require a lot of computing power. Because embedded systems are not normally programmable, once configured to serve a specific purpose, they run reliably and do not require any form of interference. However, the software on certain embedded devices can be changed, allowing for the enhancement of planned functionality.Because it is built and configured to serve a single purpose, an embedded system is a very dependable electronic component that does not require much maintenance and is relatively simple to add to a device. While they are an important component of a system, they are extremely rare to fail and do not require reprogramming, which makes them an important component of many devices that must operate independently or without assistance, such as home appliances. [5]

Based on generation embedded systems are classified as:

1. First-generation

The first generation of embedded systems were based on 8-bit microprocessors such as the 8085 and 4-bit microcontrollers.

2. Second-generation

Second-generation embedded systems were designed around a 16-bit microprocessor or microcontroller.

3. Third-generation

Third-generation embedded systems are based on a high-performance 16bit or 32bit microprocessor or microcontroller with add-ons like Digital Signal Processing [DSP] and Application Specific Integrated Circuits [ASIC].

4. Fourth-generation

System on Chips [SoCs], multicore reconfigurable processors, were used to build fourth-generation embedded systems.

Based on functional operations embedded systems are classified as:

1. Standalone embedded systems

Standalone embedded systems, such as calculators and MP3 players, do not belong to or rely on a host system.

2. Mobile embedded systems

Mobile embedded systems, such as cameras, are designed to be portable and compact while also providing ease of use.

3. Network embedded systems

Network embedded systems are used to provide network systems such as home security systems that connect cameras and sensors to the same network.

4. Real-time embedded systems

Real-time embedded systems work in real time. The output is expected within a specific time frame. They are used in the healthcare industry, the military, traffic controllers, and self-driving cars. [6]

Important Characteristics of an Embedded System:

- Completes a specific task: Embedded systems complete a specific function or tasks.
- Low Cost: The cost of an embedded system is not prohibitively expensive.
- Time Specific: It completes the tasks within a specific time frame.
- Low Power: Embedded Systems do not require a lot of power to function.
- High Efficiency: Embedded systems are extremely efficient.
- Minimal User Interface: These systems require little user interaction and are simple to use.
- Less Human Interaction: Embedded systems require no or very little human intervention.
- Highly Stable: Embedded systems do not change frequently and are mostly fixed in order to maintain stability.
- High Reliability: Embedded systems are dependable because they consistently perform well.
- Use microprocessors or micro controllers: Embedded systems design and use limited memory using microprocessors or micro controllers.

- Manufacturable: The majority of embedded systems are small and inexpensive to produce. They are based on the hardware's small size and low complexity.

Application areas of Embedded System:

Embedded systems can be found almost anywhere. We use it unknowingly in our daily lives because it is usually integrated into larger systems. So, here are some examples of embedded system applications:

- Home appliances
- Transportation
- Health care
- Business sector & offices
- Defense sector
- Aerospace
- Agricultural Sector

Objectives

- To study IOT Based Energy Meter Reading Through Internet
- To study block diagram of Embedded System
- To study system of camera-based TV management
- To study characteristic of Embedded System

II. Research Methodology

The researchers used an exploratory research technique based on previous literature from respective journals, annual reports, newspapers, and magazines that covered a wide range of academic literature on Goods and Services Tax. The research design is descriptive in nature, in accordance with the study's objectives. The study made extensive use of secondary data that was readily available. A close reading and detailed analysis of secondary sources is required in order to apply the analytical and descriptive methods to the research. It is critical to obtain additional perspectives in order to expand on the textual analysis, which would necessitate close reading analysis of a few secondary materials.

III. Result and Discussion

The embedded systems market's hardware components include silicon, printed circuit boards, firmware, target devices, and so on. Development platforms, real-time operating systems (RTOS), testing, and other software components are examples of software elements. Of course, the overall market for the devices and machines enabled by these embedded systems is much larger. [7]

Fig. 1 Many products depend on embedded systems

The processor, memory, input devices, output devices, and bus controllers are the five modules that comprise an embedded system's hardware. [8]

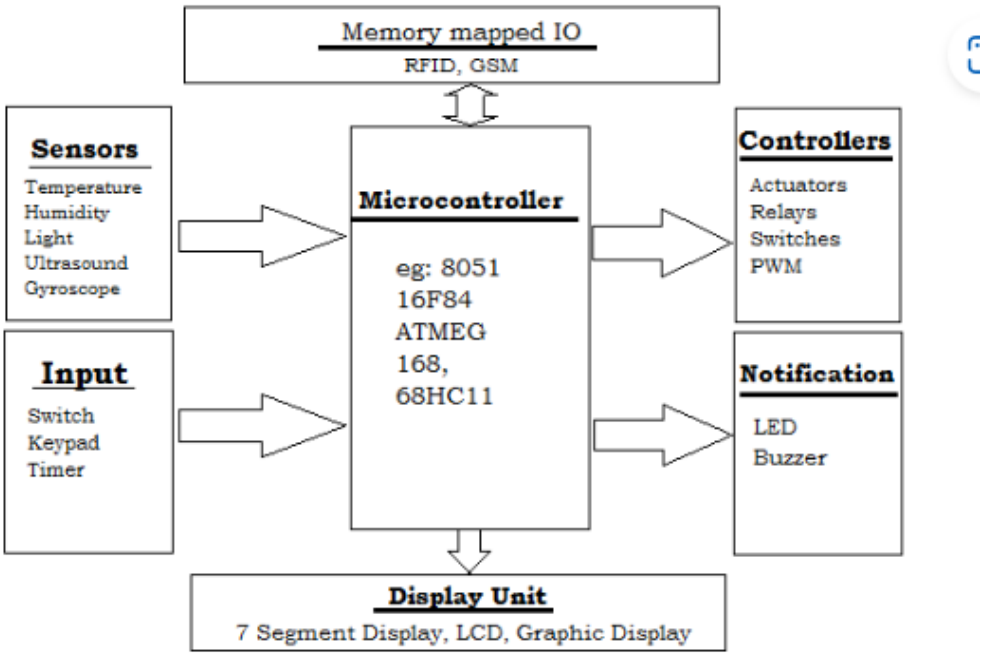

Fig. 2 Embedded systems hardware

Figure 3 depicts a camera-based TV management system prototype. The system's heart is an ARM-based BEAGLE-Board that runs Ubuntu OS and handles face detection and TV power control. Face detection [9]

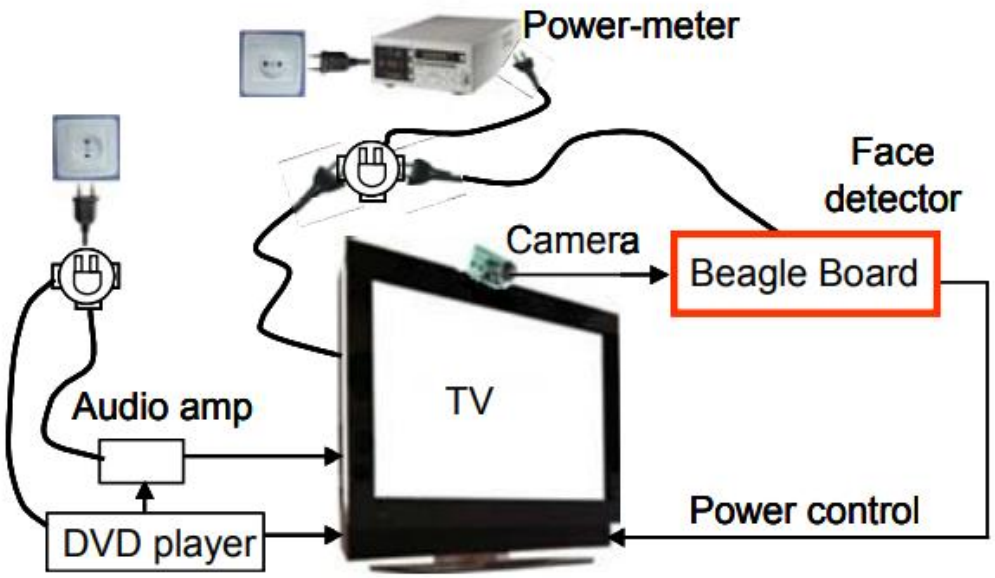

Fig. 3 Experimental system of camera-based TV management

The software employs a boosted cascade of simple features to detect human faces up to 4 metres away from the camera and 40 degrees in horizontal and vertical directions. [10-11]

For example, every embedded system includes a processor and software that runs on the processor [12]. A microcontroller or a microprocessor can be used as the processor. In order to have software, there must be a place to store the executable code as well as temporary storage for run-time data manipulations, which will take the form of ROM and RAM.

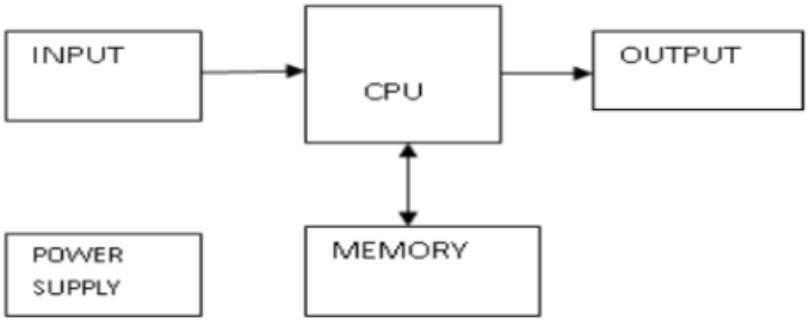

Fig. 4 Generic Block Diagram of Embedded System

In the case of small memories, they may be housed on the same chip as the processor. Such configurations are common in microcontrollers. Otherwise, either one or both types of memory will be housed in external memory chips. Furthermore, all embedded systems have some form of inputs and outputs. Sensors and probes, communication signals, and control knobs and buttons are common system inputs. Displays, communication signals, or changes to the physical world are examples of outputs. Figure 4 shows an example of this. [13-14]

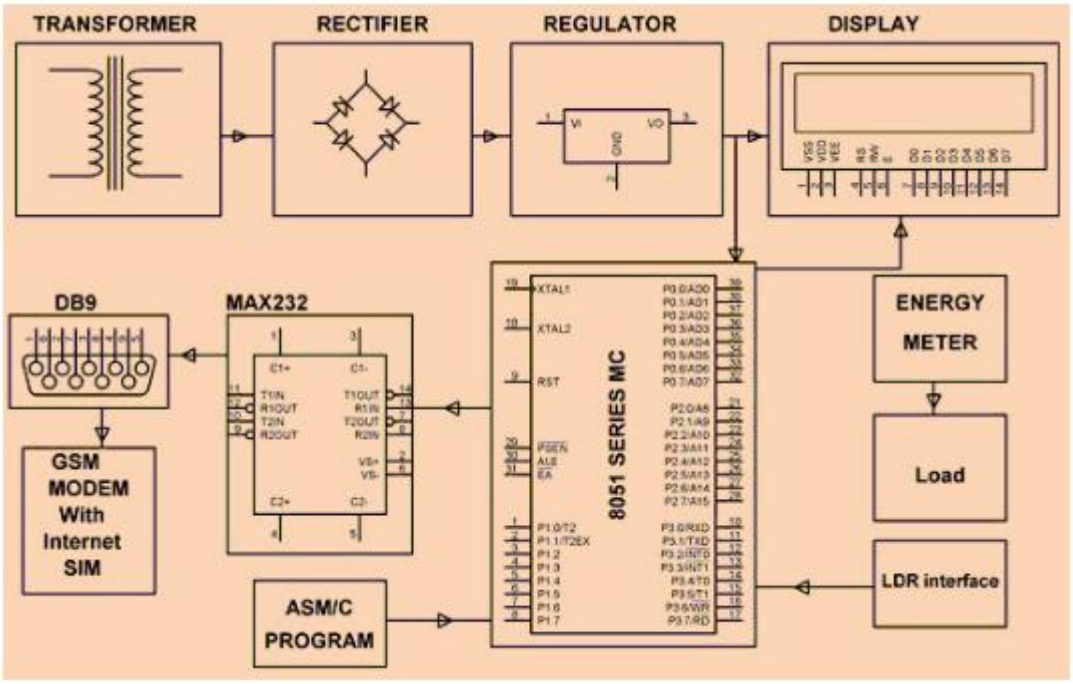

Fig. 5 IOT Based Energy Meter Reading Through Internet

An innovative application of real-time embedded systems is Internet of Things-IOT-based energy metre reading via the internet. You can use this project to display (in the form of a chart and gauge) the units of power consumed and the cost of consumption over the internet.

IV. Conclusion

Embedded systems are finding widespread use in all aspects of our lives, and their security has emerged as a critical research issue. The benefits of embedded systems are being recognised by an increasing number of individuals, businesses, and various facilities, and their use can be found in a wide range of applications, from automobiles and mobile phones to washing machines and printers. Nowadays, it's difficult to imagine our lives without embedded systems.The world of embedded systems is a fantastical realm with infinite possibilities. Consider being able to control all of the systems around you with a single or multiple gestures. With embedded systems, this may be possible. This has revealed the application areas as well as the impact of embedded systems on various types of technological development, with a focus on their efficiency in real-time applications and future use.

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