Embedded System Paper Document

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***Abstract*: An embedded system is a programmed controlling and operating system with a dedicated function within a larger mechanical or electrical system, often with real-time computing constraints. It is embedded as part of a complete device often including hardware and mechanical parts. Embedded systems control many devices in common use today.[3] Ninety-eight percent of all microprocessors are manufactured as components of embedded systems. Examples of properties of typical embedded computers when compared with general-purpose counterparts are low power consumption, small size, rugged operating ranges, and low per-unit cost. This comes at the price of limited processing resources, which make them significantly more difficult to program and to interact with. However, by building intelligence mechanisms on top of the hardware, taking advantage of possible existing sensors and the existence of a network of embedded units, one can both optimally manage available resources at the unit and network levels as well as provide augmented functions, well beyond those available. For example, intelligent techniques can be designed to manage power consumption of embedded systems. Modern embedded systems are often based on microcontrollers (i.e. CPUs with integrated memory or peripheral interfaces),[7] but ordinary microprocessors (using external chips for memory and peripheral interface circuits) are also common, especially in more-complex systems. In either case, the processor(s) used may be types ranging from general purpose to those specialized in certain class of computations, or even custom designed for the application at hand. A common standard class of dedicated processors is the digital signal processor (DSP).**

Since the embedded system is dedicated to specific tasks, design engineers can optimize it to reduce the size and cost of the product and increase the reliability and performance. Some embedded systems are mass-produced, benefiting from economies of scale.

Embedded systems range from portable devices such as digital watches and MP3 players, to large stationary installations like traffic lights, factory controllers, and largely complex systems like hybrid vehicles, MRI, and avionics. Complexity varies from low, with a single microcontroller chip, to very high with multip

I. INTRODUCTION

What is Embedded System?

A precise *definition of embedded systems* is not easy. Simply stated, all computing systems other than general purpose computer (with monitor, keyboard, etc.) are embedded systems.

System is a way of working, organizing or performing one or many tasks according to a fixed set of rules, program or plan. In other words, an arrangement in which all units assemble and work together according to a program or plan. An embedded system is a system that has software embedded into hardware, which makes a system dedicated for an application (s) or specific part of an application or product or part of a larger system. It processes a fixed set of pre-programmed instructions to control electromechanical equipment which may be part of an even larger system (not a computer with keyboard, display, etc).

A general-purpose definition of embedded systems is that they are devices used to control, monitor or assist the operation of equipment, machinery or plant. “Embedded” reflects the fact that they are an integral part of the system. In many cases, their “embeddedness” may be such that their presence is far from obvious to the casual observer.

II. CHARACTERISTICS:

a) Embedded systems are application specific & single functioned; application is known apriori, the programs are executed repeatedly.
b) Efficiency is of paramount importance for embedded systems. They are optimized for energy, code size, execution time, weight & dimensions, and cost.
c) Embedded systems are typically designed to meet real time constraints; a real time system reacts to stimuli from the controlled object/ operator within the time interval dictated by the environment. For real time systems, right answers arriving too late (or even too early) are wrong.
d) Embedded systems often interact (sense, manipulate & communicate) with external world through sensors and actuators and hence are typically reactive systems; a reactive system is in continual interaction with the environment and executes at a pace determined by that environment.
e) They generally have minimal or no user interface.

At Embedded World 2013 (Nuremberg, February 26-28), Fraunhofer researchers will demonstrate 'Smart Farming' - how the interaction of machines in cyber-physical systems operates safely and securely.Climate change, population growth and increasingly scarce resources are putting agriculture under pressure. Farmers must harvest as much as possible from the smallest possible land surface. Until now, the industry confronted this challenge with innovations in individual sectors; intelligent systems regulate engines in order to save fuel, for instance.
With the aid of satellites and sensor technology, farming equipment can automatically perform the field work; in doing so, they are more efficiently able to distribute seed, fertilizer and pesticides on the land. Nonetheless,

optimisation is gradually hitting its limits. The next step is to network these individual systems into cyber-physical production systems. These map the entire process electronically, from the farm computer to the harvesting operation, substantially increasingefficience And quality.

available for identifying pests.

Agriculture is under huge pressure due to population growth, scarce resources and climate change. Today farmers are required to harvest maximum from the smallest piece of land. Thus, this field requires assistance of something remarkable like embedded system. Several complexities are involved in farming, as farmers need to have sound understanding of climatic conditions and they must be able to change the farming process depending upon the climatic conditions. Farming practices even change according to the soil conditions and therefore computational assistance help a lot to farmers. At Embedded World (booth 228 in Hall B5) researchers from the Fraunhofer Institute for will demonstrate how agriculture will be able to benefit from networked systems in the future. Experimental Software Engineering IESE in Kaiserslautern For their exhibit, an piece of farm equipment moves across a plot of land within an agricultural diorama. Located at the edge of the farmland are two tablet PCs. Visitors to the trade show can use them to start up the automated control of the farm equipment. Six screens are suspended above the model farm. They display the processes behind the automation, showing how software manages the functionality. The visualization is intended to help visitors understand the challenges of, and solutions to, interconnecting embedded and IT systems. With intelligent networking, farmers can improve farming productivity.The networking of agricultural operations is not limited to simple task management for agricultural machinery. Besides seed and fertilizer producers, sensor technology and data service providers are joining in the mix, offering geodata and weather data; smartphone apps are also To assist and help the farmers, scientists have come up with precision farming process that optimises the complete agriculture work. This process aims to maximize the output while keeping input to the minimum. This farming practice is currently implemented in Kerala by KAU and ICFOSS, where they are looking to setup smart agriculture that would provide actual data of soil with this platform would take information from satellites and suggest the best farming practice accordingly.

Precision farming process also aims to assist farmers with market information, value-added options and post-harvest advices. In future, this system also eyes to solve labour issues by coming up with robotic farm equipment like sensor-based sprinklers, which would perform the farming practices that are usually performed by the labourers. In several countries, precision farming has gained lot of significance and the latest one to join is the Holland. This country is currently developing driverless tractors using Real Time Kinematic and GPS that will prove to be effective and cost-efficient for use in large farmlands.

III. CONCLUSION

Another example of precision farming can be witnesses at **Distributed Root Garden**, which have been setup by MIT researchers. This garden consists of tomato plants that are nurtured by Robots and right from watering the plants to providing regular nutrients to studying plant condition to optimally harvest the tomatoes, every practice is taken care of by the robots. Every plant has a sensor that provides plant's status to the robots. The entire garden is equipped with sensors to provide map and respective positions of the plants so that robots can act according to the plant's condition. Presently robots predict the fruit's condition like when it would ripe and be ready for harvest and the time when the plant would require the next nutrients. The students are free to conduct research on this garden to make it better and usable by farmers. the assistance of sensors to a cloud-based platform. After proper data interpretation.

REFERENCE

1) https://en.wikipedia.org/wiki/Embedded_system
2) https://www.elprocus.com/basics-of-embedded-system-and-applications
3) https://www.quora.com/What-is-an-embedded-system