REDEEMING OF PROCESSOR FOR CYBER PHYSICAL SYSTEMS USING RTOS

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Abstract

Cyber Physical Systems (CPS) are designed to make a software application directly interact with the events in the physical world. These systems will have a constant sensor sampling rate and processor response time. When they are deployed to processors that are shared amongst control and non-control tasks it will potentially increases CPU usage, such as cache, interrupts and task management through schedulers, which results in interference between tasks. This response time jitter reduces system stability. Hence Experiments are done in control and computing communities with the scope of maximizing CPU utilization and maintaining System stability. In this paper we develop a Microcontroller Based Multifunctional Mobile Robot with real time movement is demonstrated which replaces huge man power for various applications. It is designed for Military purpose and functions at critical time. Navigation of the Robot is done through Zigbee technology and it uses RF to communicate with the Tankers. A Wireless AV receiver at the Base station displays the images captured by the Camera. To make the Robot highly secured it is coupled with a Laser gun and it interacts with the physical world through sensors such as Obstacle sensor and Vibration sensor. All these functions of the Robot are completed within their deadline through Salvo Rtos.

Keywords: *—CPS, Rtos, Wireless robot, salvo, revitalization, CPU resources*

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1. INTRODUCTION

Cyber-physical systems research mainly aims at safety, security, efficiency and to develop high confidence systems in which cyber and physical designs are compatible, synergistic, and all operates at real time. Hence for such systems the processor should be highly calculable and should possess high end capabilities to meet up with unpredictable conditions.[4] This results in the necessity of revitalizing a processor to remain stable ,perform efficiently by reducing the jitter, delay, congestion between tasks and manages energy and power effectively even when maximum resource is utilized.

The Current Approaches are used to develop enormously complex and expensive monolithic humanoid robots. But CPS approaches results in simple, cheap, networked robots. So in this paper we are going to examine a simple, wireless robot which is designed to be used in defense field .Here, the Robot is a computational device which interacts with the physical world through sensors and navigates according to the instructions from the server and completes all tasks within the critical time.

2. ARCHITECTURE OVERVIEW

Embedded Based Multifunction Mobile Robot with real time movement mechanical model is developed, which can replace huge man power for various applications in real time environment. The existing systems will perform only the specific tasks like rescue operation or firing, but the proposed model performs various operations like detecting the obstacle, border security, audio video recording, Firing, Obstacle detection, Vibration detection, alarming. DC motors are used for all type of movements like moving forward, reverse, tuning left and right and 360°rotation. Each and every actions of the Robot is controlled from the Base station..As the Robot is designed to work in the war field ,all the task assigned to it should be completed within critical time otherwise it may result in catastrophic events.

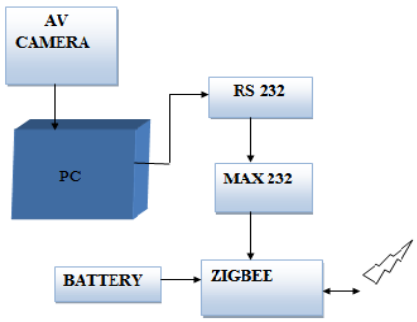

Fig 1 Base Station

Therefore all the tasks are designed to be scheduled within the critical time and the complete functionality of the Robot is grouped under various modules. They are Microcontroller module, RF Module, Sensor module, Control and monitor module, Zigbee module. The Robot is navigated only according to these images. As the server uses zigbee technology to communicate with the Robot the maximum distance covered is about 200m to 300m.

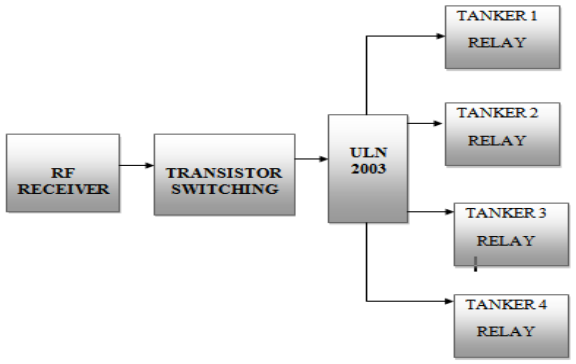

Fig 2 Tanker Section

The robot has a laser gun to fight against a single opponent. With the help of obstacle sensor it detects the obstacle in front of it. To make the robot invisible we have a vibration sensor to turn on or off the Solenoidalvalve. Finally when it needs the help of Tankers it uses RF module to communicate with them.

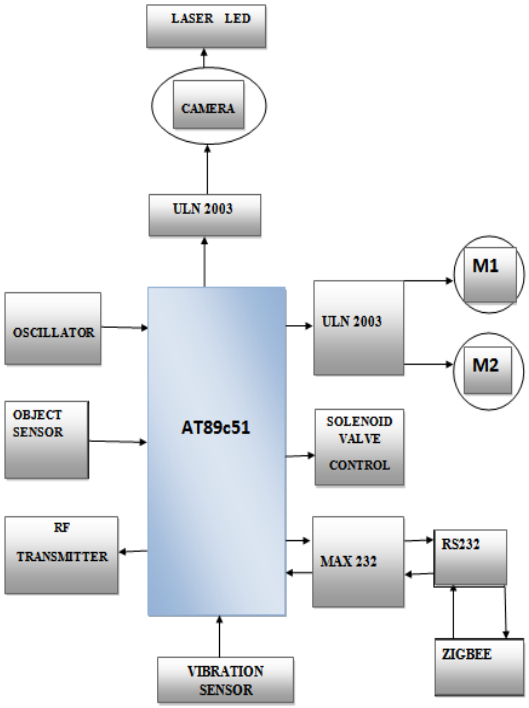

Fig 3: Robotic Section

3. SOFTWARE IMPLEMENTATION

As discussed earlier, the basic requirement and challenges in CPS, we need a **software** that makes these systems to work effectively in unpredictable conditions. Here we choose RTOS for our application. RTOS an OS which works in real time. Time and makes sure that all the tasks meet their deadline..

Selection of a particular RTOS for an application depends on the processor and development tools. Therefore ,Here for a 8051 controller 'Salvo'– 'the RTOS that runs in tiny places' is chosen.Salvo is a commercially available RTOS specially intended for the small embedded system, with a version which works with the Microchip C18compiler.

3.1 Salvo Features

Salvo provides a powerful flexible framework with a complex design and leverages the processing power. which we can quickly build our application. Salvo has sixteen priority levels and support event and timer services. It is written in ANSI C with small number of processor specific extensions. Salvo is highly configurable and supports any application.

Visual Basics is used to create the control screen to pass the instructions to the Robot.

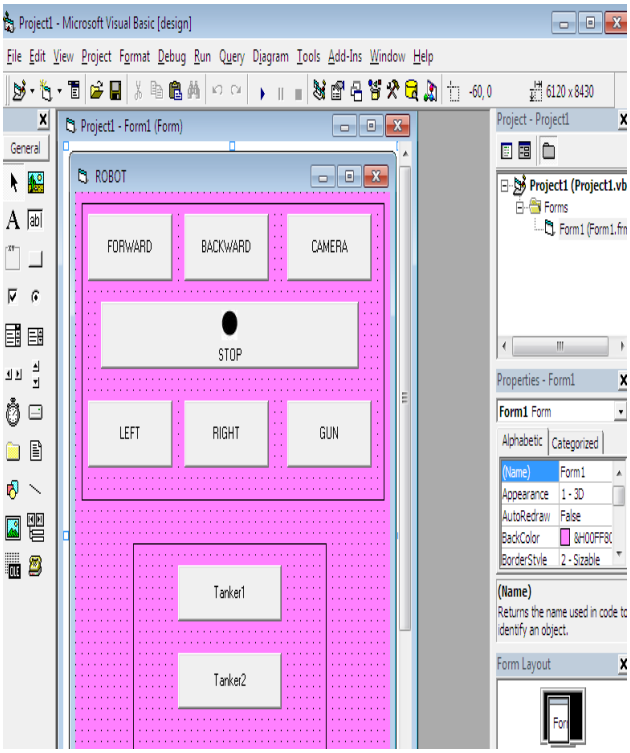

Fig 4: Control Screen

4. CONCLUSIONS

A scalable mechanical model that executes Rtos code was implemented and it was made to function efficiently when maximum resource is utilized. This Robot is made to work reliable, stable at unpredictable conditions, thus fulfilling the major requirements of future engineer systems. In the Robot the electronic boards , DC motors, sensors and battery are sensibly integrated .The wheels are fixed to the base plate, which are driven by the two DC motors. Battery is placed over the base plate. The centre plate holds the electronics and the top plate acts as a cover with a camera. Any objects weighing below 25kg ca n be placed over it. The real time mechanical model is fabricated using mechanical grade Teflon sheets.

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