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Pi- Node Monitor Robot

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Abstract: **In this project work, we are going to make a Pi- Node monitor Robot(PNmR). A User based GUI application is used to guide the robot through the sensor node path. Radio waves acts as a communication medium between the sensor node and the PNmR. Sensor node is configured to read the PNmR entry by ultrasonic signal. Node temperature will be analysed at each signal break and PNmR Camera will be enabled to capture the scenario in case of high temperature. This paper uses Raspberry Pi for PNmR and ARM processor for sensor node implementation. The Raspberry Pi is a credit card sized single computer or SoC uses ARM1176JZF-S core. SoC, or System on a Chip, is a method of placing all necessary electronics for running a computer on a single chip. It needs an Operating system to start up. SD/MMC card will acts as a bootable hard disk. ARM 7 based sensor node section uses radio signal to communicate with robot.**

Keywords: **Raspberri Pi, PC, LAN, Python.**

I. INTRODUCTION

In the 21st century the demand for Industrial data acquisitation is increasing day by day. There are many reasons for which a process has to be under control without human intervention. There are some events in which we have to monitor and control temperature stringently, such as industry furnaces, oil refineries, hospitals, chemical industry, food and marine industries etc. The trivial variation in temperature may cause substantial damage to the whole plant. So, maintaining temperature within desired set point is crucial. Therefore continuous monitoring of the process is of utmost importance. This can be achieved through data acquisition system. Also, nowadays, because of industrialization and technological demands, analysis and synthesis of a data became as a part of practice. Hence data acquisition system is obligatory. Also The Camera surveillance systems play an increasingly important role to maintain social security. It has been widely used in many fields, such as finance, public security, banking, and home. Traditional camera surveillance can generally achieve close distance monitoring, by using the PC as a monitor host, monitor host connected monitor camera with coaxial cable. With the development of IT technology, especially the rapid development in embedded CPU of the open Linux systems, camera conferencing, remote monitoring, and mass data processing fields can apply the embedded technology. This embedded monitoring system to overcome the week points of the traditional camera surveillance systems, such as complex structure, poor stability, and expensive cost. Meanwhile, it possess some advantages, for example, hardware and software can be cut, compact construct, portable, low power consumption, more suitable for long-distance transmission. We can implement it with a mobile robot.

A mobile robot is a machine that is basically place or mounted on a movable platform and can be with the help of certain instructions. In today's world a lot of fields use mobile robots. Many of the complex robots that we now see have originated from the simpler mobile robots. This technology has increased many new applications in the industry. The combination of mobile devices and robots are leading to new ideas in lots of fields.

The development of industrial robotic systems still remains a difficult, costly, and highly time-consuming operation. Commercial robot programming environments are typically closed systems. They notably support very limited connectivity with other vendor products and are often customized for particular applications [Dac92]. If we consider material handling applications and assembly systems, additional issues emerge. They are indeed tailored for manipulation of identical parts, hence they require substantial modification for different products. Increasing the flexibility raises a great deal of issues in terms of programming, sensor interaction, and object representations. The design of the architecture presented in this thesis is centered around those issues. Our goal is to have at our disposal a flexible platform for the control and development of complex robotic applications. Our investigations for this project are thus concentrated on high-level programming environments for rapid prototyping and flexible manufacturing.

An Industrial surveillance system based on an embedded system with multiple ultrasonic sensor modules to enhance the system's reliability. Each ultrasonic sensor module includes a transmitter and a receiver, and the modules are placed in a line direction. The aim of this paper is to develop and implement an affordable low cost web-camera based surveillance system for remote security monitoring.

II. DESIGN AND IMPLEMENTATION

In this project, control of robotic unit is from remote end with the use of PC and also we are able to get the images from the robot end for the purpose of surveillance. At the user PC, we will have images on the personal mail and also we are able to control the robotic movement and also the camera movement in-line with robot direction. Raspberry Pi is used for image

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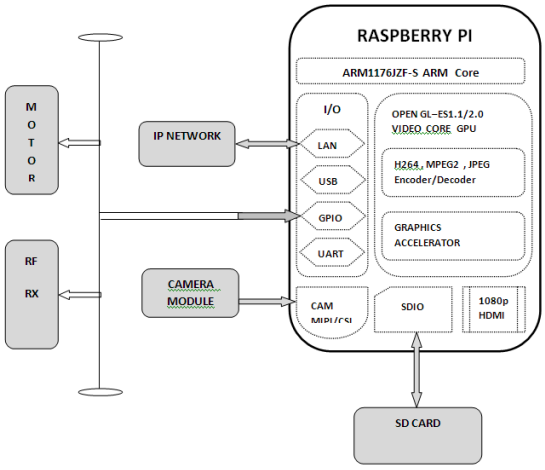
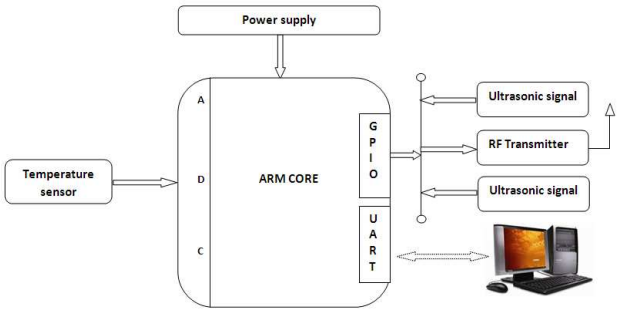
processing and sending the processed image to user's mail with the Internet using SMTP protocol. The use of Internet does not bring the limitation of range into consideration as if we have the internet access, we can retrieve images from anywhere around world. DC motors are being used for the movement of robotic wheels are interfaced to raspberry pi with L293D voltage driver to the pin numbers of GPIO12 GPIO16 GPIO20 and GPIO21. The web cam interfaced with USB gives us imaging information, which is working through FSWEBCAM drive installed on pi. The images captured by the camera should be processed very fast to provide real time visualization of environment to the user. For this purpose along with low cost we think to use ARM7 based Processors. Some of the reasons for the proliferation of ARM-based processors include: low cost, low-to-very-low power consumption, decent processing power, and open development environment. Temperature sensor and ultrasonic sensors are being interfaced to arm7 lpc2148 microcontroller to ADC channel1 and GPIO16 respectively. To control the robot user have to give the inputs form consol terminal which are received serially to LPC2148, controller reads these interrupts and now depending on received interrupt respective RF TX signal is transmitted (these RF TX pins are connected to 1.24, 1.25, 1.26, 1.27 pins on controller) these signal transmission is done by making these respective pins 1.24, 1.25, 1.26, 1.27 low depending on particular received interrupts. Now these RF signals are encoded through HT12E and are released in RF spectrum with 433.5Mhz, which are collected by robot node controlled through raspberry pi, these signals are decoded using HT12D and are fed to GPIO6 GPIO13 GPIO19 and GPIO26 pins of raspberry pi. We created a python scripting which imports raspberry pi GPIO, SMTP protocol, and system dependencies. Here the coding depending on the received signal through RF the pin status of raspberry pi changes , if the pin status goes low those respective conditions will be satisfied, I,e moving robot directions forward, left, right and capturing image.

III. BLOCK DIAGRAM

ROBOT SECTION



NODE SECTION



IV. SYSTEM HARDWARE

Raspberry Pi B+: We have used Raspberry Pi B+ as it is the latest one with more features. At first Raspberry Pi foundation developed Raspberry Pi in UK which is one kind of minicomputer. It uses Python as the main programming language. The Raspberry Pi hardware went through many featured variations in hardware performance, memory capacity, and peripheral device support. Raspberry Pi B+ consumes the lowest power among all the other versions. It has low noise power supply so can provide better quality audio.

Features: Broadcom BCM2835 SoC Chip

- 700 MHz ARM1176J core CPU
- 512 MB SDRAM
- 4 x USB2.0 Ports with up to 1.2A output
- Expanded 40-pin GPIO Header
- Power: Micro USB socket 5V, 2A
- Camera Connector: 15-pin MIPI Camera Serial Interface (CSI-2)
- Memory Card Slot: SDIO
- USB: 4 x USB 2.0 Connector
- Dimensions: 85 x 56 x 17mm
- Power Requirements: 5V @ 600 mA via MicroUSB or GPIO Header
- Supports Debian GNU/Linux, Fedora, Arch Linux, RISC OS and More!
- GPU: Dual Core Video Core IV® Multimedia Co-Processor Provides Open GL ES 2.0,
- hardware-accelerated Open VG and 1080p30 H.264 high-profile decode Capable of 1Gpixel/s, 1.5Gtexel/s or 24GFLOPs with texture filtering and DMA infrastructure Operating System: Boots from Micro SD card, running a version of the Linux operating system.

Ultra Sonic Sensor Our ultrasonic range finder is capable of allowing the user to determine his or her distance from an object or wall. When deciding on what type of project to

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design and construct, we decided that we wanted to create something that would have some practical use in life. Many groups in the past created video games, but we wanted to be different. We considered issues such as safety, user interface, and ease of use, and came up with the idea of making an ultrasonic rangefinder. A rangefinder can be used in various applications such as a measuring device or an obstacle detection device.

Temperature Sensing element

The LM35 series area unit exactitude integrated-circuit temperature sensors, whose output voltage is linearly proportional stargazer (Centigrade) temperature. The LM35 thus has a bonus over linear temperature sensors calibrated in ° Kelvin, because the user isn't needed to calculate a large constant voltage from its output to get convenient Centigrade scaling. The LM35 doesn't need any external standardization or trimming to produce typical accuracies of ±¼°C at area temperature and ±¾°C over a full -55 to +150°C temperature range. Low value is assured by trimming and standardization at the wafer level. The LM35's low output electrical resistance, linear output, and precise inherent standardization build interfacing to readout or management electronic equipment particularly straightforward. It will be used with single power provides, or with and and minus provides.

As it attracts solely sixty µA from its provide, it's terribly low self- heating, but zero.1°C in still air. The LM35 is rated to operate over a -55° to +150°C temperature vary, while the LM35C is rated for a -40° to +110°C vary.

The LM35 series is accessible packaged in tight TO-46 transistor packages, whereas the LM35C, LM35CA, and LM35D also are accessible within the plastic TO-92 semiconductor device package. The LM35D is additionally accessible in associate degree 8-lead surface mount little define package and a plastic TO-220 package.

V. CONCLUSION

Robot is a very important element of present development which will lead us to the fast and easy life what we all are dreaming. For that reason now a days it is essential to interact with robot and make happen what we want to be done by them. This humanrobot interaction part is very challenging area. Controlling robot and take pictures from remote distance is very simple but very beneficial to some specific persons like director, spy, firefighter etc. This robot can take pictures where human can‟t go or survive. The main target of this project is to build a robot which can take both touch and voice command and can take pictures of remote and unreachable area where it is impossible for human to go.

Lots of scopes are there to increase the efficiency of „Intelligent Camera Robot‟. Firstly, Overcome obstacles can be regained by increasing the chassis and the ground. One of the ways to do this is by using meccanum wheels which have bigger diameter. Another way is by giving more voltage to DC motors of meccanum wheels. Then, faster height change can be done if 12V can be provided to the actuator. Maximum and minimum height is available for the actuator. Multiple stoppages can be made between the highest and lowest height to have various height for the camera. We can have more accurate picture around 360 degree ranges by increasing the division amount of servo angle. Mechanism can be faster and more efficient by only using raspberry pi for controlling everything.If we do raspberry pi code for this then picture upload delaying time can be reduced. We can improve the app in such a way that the voice commands can also be recognised by the S Voice of Samsung mobile. Replacing the pi camera by USB web camera, we can have high resolution picture quality. Adding live video streaming in the application is one of the main and important sides what can be developed. So that we can see the view which camera can capture on that moment. Actually it will help us to see what we are going to capture. If the camera focus is not in the right position, it will also help us to adjust the focus of camera what we desire for to capture.

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