Video Surveillance Robot with Multi Mode Operation

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Abstract - **This paper describes the implementation of the wireless robot control system for monitoring purposes. Over the past decade, we have seen increased levels of investment in autonomous vehicles for surveillance and security used. On the domestic side, the robots are only used to detect human movement in the region and store it in the database to record, but on the side of the defense, the robots are used to detect the movement and directly send to the control room and capturing the person on the field. We propose a cost effective four wheels surveillance robot of an Arduino microcontroller and ZigBee technology. Here ZigBee technology is used to control the robot, using a laptop. This system is very useful for monitoring in areas where there is no Internet connection and also the collapse of the communication system during a disaster.**

Keywords - Surveillance; Arduino robot; security; wireless communication.

I. INTRODUCTION

Surveillance means the process of monitoring a situation, region or person. This usually occurs in a scenario where military border surveillance and enemy territory is essential to the security of a country. Human Monitoring is achieved by deploying close to sensitive areas of staff to constantly monitor the changes. But humans have limitations and deployment in places that are not always possible. There are also additional risks losing the staff in case of being caught by the enemy. With advances in technology over the years, it is possible to monitor remote areas of importance by using robots instead of humans. Besides the obvious advantage of not having to risk any personnel, land and air robots can also look for details that are not visible to humans. By providing the high resolution cameras and various sensors, it is possible to obtain distance information to specific area.

Most conventional monitoring systems are installed in fixed positions, and only with simple visual Processing capabilities. A major disadvantage of these systems is that as soon as the objects are obscured or blinds pots, you cannot get your image information. Also, monitoring the entire area for an environment is not feasible. To increase the general approach to address this problem, the number of Multi-view cameras monitoring are required. However, the cost of both hardware and system development increases.

II. RELATED WORKS

The field of surveillance robots is very popular. A lot of work was done in the algorithms and the navigation control System wireless surveillance robots [1], [2]. A common subject is also the use of a camera on the robot to receive live feedback of the video [1], [3], [5].

As seen in all documents and previous research they use webcams. Web cams requires Internet, one of our application is under the supervision of the tragedies and terrorist attacks [4]. Internet system or communication fails these situations because of traffic so there is no use of webcam so here we use AV camera that does not depend on third party network but depends on its own network. For a long distance communication according to previous documents [6] [7], they used the Internet or Bluetooth control, but Bluetooth has only 10 meters range. So instead of Bluetooth, ZigBee is the best solution.

III. SCOPE OF THE PROJECT

The previous experiment, we saw that for each application, they depend on third party say Internet [4]. Also in some experiments they used Bluetooth, but have very low maximum range of 10 meters [8]. My scope is to surveillance system that does not depend on the Internet or a third party with sufficient reach. Also, we need to include distance measurement and temperature along with night vision. We want to make this system as advanced system and compatible with all features.

IV. NEED FOR ROBOTICS

Often, the robots are used to do work that could be done by man. However, there are many reasons why robots are better than humans in performing certain tasks.

A. Speed

Robot can be used, as they are faster than people at the tasks. Indeed, the robot is really a mechanism which is controlled by a computer. Some robots can move faster than we can, so that they can carry out a task such as support and integration of products, faster.

B. Hazardous (Dangerous Environments)

Robots can be used because they can work in places where a human being would be in danger. For example, robots can be designed to withstand extreme conditions of heat, radiation, chemical fumes, than that of humans could withstand.

C. Repetitive Tasks

Sometimes, the robots are not really much faster than humans, but they are good at simply doing the same work over and over again. But this becomes easy for a robot, because once the robot was programmed to do work once; the same program can be run multiple times to perform several times a job. And the robot will not be bored as a human would.

D. Efficiency

Efficiency is all about the execution of tasks without waste. This could mean not to waste time, do not waste materials, do not waste energy.

E. Accuracy

Precision is all about performing tasks very accurately. In the factory production of items, each item must be made identically. When items are assembled, a robot can position parts in fractions of a millimeter.

V. PRINCIPLES OF SURVEILLANCE ROBOT

Surveillance robot can be used to recognize and detect motion automatically in the robot's surrounding environment. Robot design was shared in the sensor, control and planning subsystems. Robotic control device is constructed on a platform designed for security and monitoring tasks. This means it can be remotely controlled by a human as a sentinel surveillance camera movement or it can independently lead along a defined path, detect all inconsistencies in the video input. Secret surveillance closely confined spaces is required in many military and civil activities, such as landslides and raiding enemy within hostage rescue missions.

These special applications require a miniature laptop robot to operate in secret in very confined environments. In this approach, we can detect the moving targets by the robot using the wireless camera. Adapt for different lighting conditions, the target model is updated regularly on the basis of an updating mechanism. To ensure a robust tracking, the robot detects abnormal human behavior following the upper body of a person. To lower the false alarms by the motion detection system, gas detector, fire metal detector sensor directs the robot to the scene where events occur and the robot can use its camera to advance confirm the occurrence of events.

VI. PROPOSED WORK

A. Arduino UNO

The Arduino Uno is a ATmega328P micro controller based board [10]. It has 14-pin digital input / output (from which 6 can be used as PWM outputs), 6 analog inputs, a ceramic resonator 16 MHz, a USB connection, a power jack, ICSP header, and a reset button. It contains everything needed to support the micro controller; so that we can simply connect it to a computer with a USB cable or power or battery AC-DC to start.

The main reasons for choosing Arduino UNO are

- Our requirement for PWM pins to control stepper motor.
- Works on low power as well as further modifications are possible.
- Sufficient number of I/O pins.
- Small size which can be easily assembled and work on open source.

B. ZigBee Technology

The zigbee Modules were engineered to meet IEEE 802.15.4 standards and support the unique needs of low-cost, Low-power wireless sensor networks. The modules require minimal power and provide reliable delivery of data wirelessly between devices. The modules operate within the ISM 2.4 GHz frequency band and are pin-for-pin compatible with each other. Here we will use zigbee for controlling the motors and for receiving signals from robot.

C. Project Block Diagram's and Working

Our project will be actually on robotic vehicle, which can operate both autonomously along a given pre-defined path or can be operated manually in the inspection systems are provided like surveillance AV camera which is wirelessly connected with temperature sensor and humidity sensor; also we can operate that vehicle wirelessly using zigbee.

This project has two sections Transmitter and Receiver

- Transmitter is a laptop on which we will use the Hyper-terminal and ZigBee transmitter is connected to the USB port for transmitting control channels to the robot, video receiver will be connected to another USB to receive the AV device signals.
- Receiver is robot which has temperature and humidity sensors which will sense temperature and humidity levels and will transmit the signals to laptop using zigbee trans receiver which will be seen on hyper-terminal also two motors and stepper motor are controlled from laptop using Zigbee & Hyper-Terminal. AV camera attached to stepper motor will be mounted on robot which will transmit Audio - video to laptop.

1) As considering figure 1

- This project focused on the experimental study of Arduino and controlling input / output C programming language. Here Arduino is selected because there is sufficient I / O pins also more modifications are possible without changing the platform.

- First step is to provide specific power supply to Arduino as well as motor drivers and motors. Interfacing of I/O devices like motors is done by using the instruction "*digitalWrite(xpin, HIGH);*"
- For interfacing of motors we use 3,4,5,6 pins and for stepper motor 8, 9, 10, 11 digital pins are used. For reading the values for temperature sensor and humidity sensor analog pins 1, 2 are used and the values are read by using the instruction "*analogRead (xpin)*". Interfacing of zigbee can be done by interfacing to UART pins of Arduino, there are pin number 0 & 1 available as UART (Rx & Tx) which are made available for serial communication.
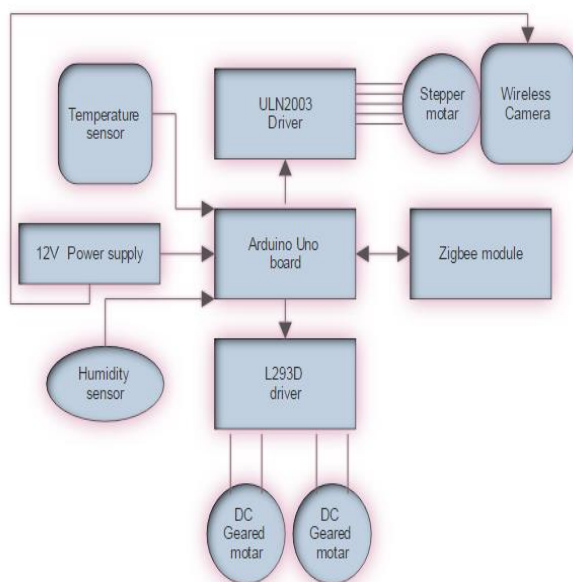- AV Camera mounted on mobile robot will send modulated signals to trans-receiver.

Fig. 1. Robot using Arduino, ZigBee and I/O interfacing

2) As considering figure 2

- Here in fig. 2 laptop which will act as trans-receiver with initial interfacing of zigbee, the zigbee Trans receiver will be connected to one USB port of laptop using USB to TTL converter. By this we can receive signals from zigbee also can send control signals to robot by using hyper-terminal software.
- Secondly laptop is interfaced with T.V. tuner card which will be connected to another USB port, the AV receiver antenna will be interfaced with T.V tuner. By using this T.V tuner connected to AV receiver antenna laptop will receive video signals & will be displayed on the screen.
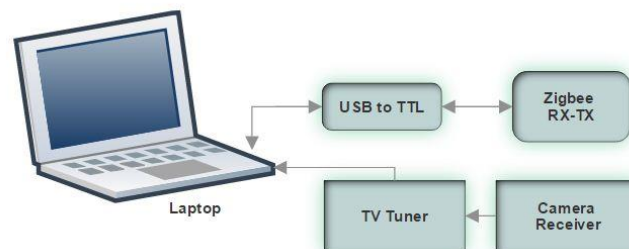

Fig. 2. Trans – Receiver controller using Laptop
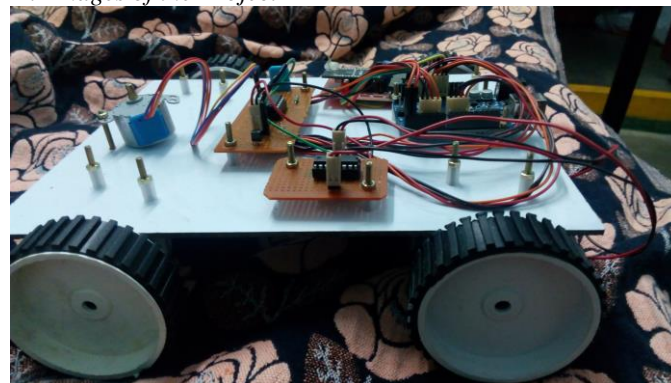
D. Images of the Project
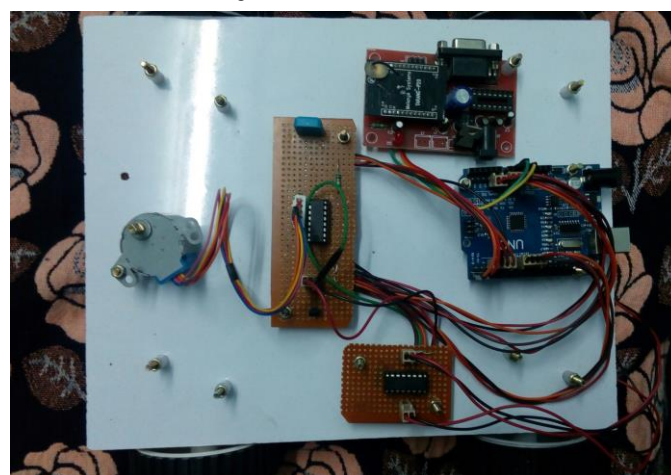

Fig. 3. side view of the root

Fig. 4. Top view of the root

CONCLUSION

The surveillance robot was designed with ATmega328P microcontroller using embedded platform. It monitors and secures a place among the adversaries that can be made by surveillance robots all the time with great accuracy and high accuracy. AV camera is used which continuously monitors the robot surroundings and sends the video information to the control station.

FUTURE SCOPE

The project future scope has numerous openings that could be prosecuted for various future applications for monitoring and control, etc. This robot can also be used in times of environmental catastrophes where the robot detects whether a living human being is present in that region. In domestic applications such as home security can also be implemented using this method.

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