A Spy Robot for Military Applications

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Abstract- **We have developed a robot prototype for the purpose of spying in war fields and on border lines applications. This robot is being developed with the help of line following and obstacle avoiding techniques on Atmega8 microcontroller along with a Raspberry pi. A wireless camera is integrated with this module. The camera captures images and videos and transmits it remotely to a PC. This prototype bot can be used by the military to obtain information about the enemy territories.**

Keywords— Real time positioning, spy robot, path follower.

I. INTRODUCTION

The bot can detect the presence of an object by acting as an obstacle avoider and also gives its real time positioning [1]. The bot is computationally controlled which makes it easier to use. We integrated raspberry pi software to the hardware using Python language. This work can be widely used in ROBOTICS as a number of attributes can be added to it to give more precise information.

II. STRUCTURE AND WORKING

The basis of a spy robot is its mechanical structure. The model which we are making is just a prototype of the actual bots used in the remote areas and borders. The basic feature we are using here for the movement of the bot is of line following [2]. It is integrated with raspberry pi (version 3) and a camera for accurate results. It majorly does the following functions: (i) Captures position of the line with IR sensors mounted on the front end of the chassis, (ii) The IR sensor output is sent to the controlling circuit which does the processing, (iii) After the processing is done, the circuit sends required signals to the motor drivers to control the movement of the robot (right or left), (iv) If the robot faces an obstacle the circuit is so designed that the obstacle is avoided by changing its path, (v) The robot can record videosof short duration and (or) click photographs because of the camera integrated with the raspberry pi software.

Assembling of the subparts is an essentially important part of building of any system. Following are the major components used for building of the spy robot which are assembled to give the desired result (i) Microcontroller, (ii) Chassis and body, (iii) IR Sensors, (iv) Motor drivers, (v) Actuators (Motors and wheels), (vi) Raspberry pi model 3b along with REV 1.3 camera module. The proposed spy robot module assembled with these components is shown in Fig. 1 and the raspberry pi model 3b along with REV 1.3 camera module is shown in Fig. 2.
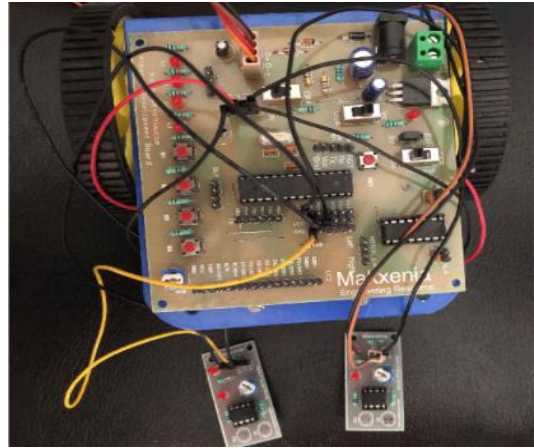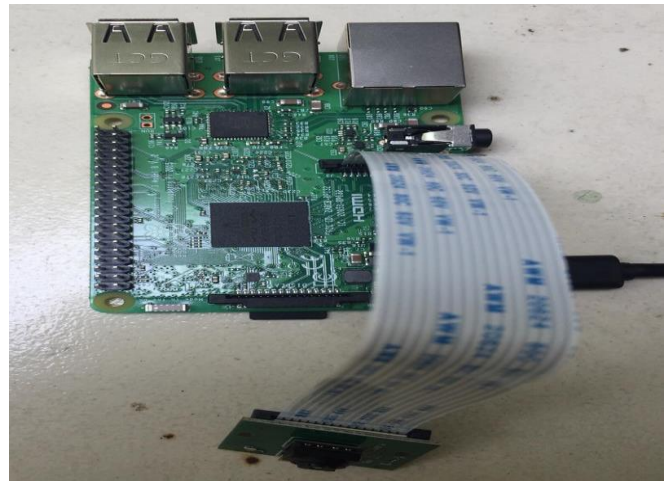

Fig. 1. Proposed Spy Robot Module

Fig. 2. Raspberry pi model 3b along with REV 1.3 camera module

A. Microcontroller

We have used an Atmega 8 microcontroller with the following parameters [3] : 8Kb flash memory, CPU speed 16 MIPS, 1 Kb RAM, 512 bytes Data EEPROM, (Digital Communication Peripherals 1-UART, 1-SPI, 1-I2C), (Capture/Compare/PWM Peripherals-1 Input Capture, 1 CCP, 3PWM

Timers-2 x 8-bit, 1 x 16-bit), Comparators-1, Temperature Range (C) -40 to 85, Operating Voltage Range (V)-2.7 to 5.5, Pin Count-32.

B. The Chassis

The Chassis is an important part of the robot's body. All the load bearing is done by the chassis so it must be strong enough to sustain itself in dynamic conditions like shocks, vibrations and torque and torsion [2]. A PCB is used here and all the components like the microcontroller IC, motor driver ICs, LEDS are installed onto it.

C. IR sensors Motor Drivers

We used a 3 pin IR proximity. It has 3 pins GND, VCC and output which is given to the microcontroller. The sensor detects reflected light coming from its own infrared LED. It measures the amount of reflected infrared light and detects light or dark (lines) or even objects which are directly in front of it. An LED indicates the presence of a line or detects if any object is present. The specifications of this sensor are as follows [4] : 5V DC operating voltage, I/O pins are 5V and 3.3V compliant, Range: Up to 20cm, Adjustable Sensing range, Built-in Ambient Light Sensor, 20mA supply current, Mounting hole.

D. Motor Drivers

We have used a L293DNE MOTOR DRIVER IC [3]. This is basically an IC which takes input from microcontroller and is able to drive the DC and stepper motors by using separate power supply.

E. The Actuators (Motors and wheels)

We have used basic motors with the following specifications which are connected to simple wheels which in turn drive the robot into desired direction. Specifications [5] : RPM- 200 rpm at 12v, Voltage- 6V to 12V, Stall Torque- 0.5 kg-cm at 12V, Gear- Plastic (Spur), Shaft size-6mm diameter.

Raspberry pi Specifications [6]: SoC: Broadcom BCM2837, CPU: 1.2 GHZ quad-core ARM Cortex A53 (ARMv8 Instruction Set), GPU: Broadcom Video Core IV @ 400 MHz, Memory: 1 GB LPDDR2-900 SDRAM, USB ports: 4, Network: 10/100 MBPS Ethernet, 802.11n Wireless LAN, Bluetooth 4.0

III. REAL TIME TASK SCHEDULING

After all the components are assembled properly, a code was written in the AVR studios software on the laptop which was further written onto the microcontroller using the ROBO Sapiens boot loader.

The microcontroller receives input from the sensors and sends the required output to the driver IC. The driver then supplies the voltage required for the motors to move in desired direction as per our requirement. The movement is described as follows [7] : (i) For forward movement, both the motors rotate in same direction (clockwise) simultaneously, (ii) For turning left, the left motor rotates clockwise whereas the right motor rotates anticlockwise, (iii) For turning right; the right motor rotates clockwise whereas the left motor rotates anticlockwise.
(iv) For moving backward both the motors rotate anticlockwise, (v) If the robot senses an obstacle it moves backward and then by default moves left and then carries out the remaining movement accordingly as per further sensing. This is all done in real time.

IV. RESULTS AND DISCUSSION

The bot captures images or videos as per the commands given by the raspberry pi. Figure 3 shows one such image captured by the bot. It is saved in the SD card which is being used throughout the working of the bot. As a result we can get real time information about the surroundings. The bot follows the path as instructed by the microcontroller board as discussed earlier. The path of the bot varies as per the presence of lines and objects in its way.

Fig. 3. Caputerd Image by the Spy robot

V. FUTURE SCOPE

1. It can be used as a servant robot by implementing Automatic Guided Vehicle (AGV).
2. By using a temperature sensor, one can measure temperature and convert the values into electrical values using a converter. This has a lot of industrial applications.
3. Using the concepts of Nanotechnology, it generates its own power.
4. By adding a voice recognition system, one can control the bot using voice signals.

VI. CONCLUSION

The bot can be steered as required and also performs the function of an obstacle avoider. We integrated a camera using raspberry pi. It is thus able to provide real time positioning until a range.

VII. ACKNOWLEDGMENT

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