Voice Controlled Robotic Car Using Arduino for Smart Agriculture

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Abstract: Agriculture is most important fields in our day to day life. But people travelling from rural to urban area are most common problem in today’s agri. So to give more benefit in this it include smart agriculture based on monitoring through android watch which is wore by farmer so that the person can monitor the crops and farm land through watch. It includes monitoring of humidity of crops defects of crop, temperature of crops, proper irrigation and environmental factors continuously. Various nodes are fixed on different areas in the land. Controlling these sensors through robot with interfacing through android watch, Wi-Fi, arduino board. This project is created as a project and given to the farmer’s welfare.

Keywords: Sensors, Android Watch, Arduino board, Raspberry-pi, Voice Command, Robotoperation, Wi-Fi network.

I. INTRODUCTION TO SMART AGRICULTURE

   As the world is going under the smart system and various new technologies. It is necessary to trend these features into agriculture also. Most system is fully deployed at various nodes and with the collection of wireless sensor network and protocols. Many researches are done mostly in agriculture only nowadays. So it is necessary to include smart system in agriculture.

   The required data that is collected based on the agriculture are fully smart controlled system with the help of android watch sensing through voice controlled processing by robotic car.

   In spite to reduce all these problems in increasing the yield of the crops it is helpful to implement these systems in agriculture.

   Though it is implemented in research level only it is not still given to the farmers as a project output to get benefitted from the resource. This is fully based on the interconnection between the farmers and with various communication methods. It is transformation from the wired device to the wireless R.Karthisikeyan and C.JothiKumar (2014) device.

   In this paper we present a robotic car, with user friendly architecture,
Bluetooth sensor, and various advanced sensors (such as: light sensor, moisture sensor, humidity sensor, temperature sensor, pressure sensor, pollution sensor, damage of crop sensor).

It is fully controlled by voice recognition command operated by the farmer from wherever the person works apart from the farm land.

The main benefit of this system is the farmland is fully monitored by the farmer through watch from where the person work or far apart from the land. The person can sense the full view of the land by getting various notifications of the crops sensing through watch.

Hence this paper purely deals with the development in agriculture from normal agriculture to smart agriculture through new technologies by including android watch through Bluetooth with interfacing them in arduino board with the help of voice commands.

II. EXPERIMENTAL SETUP

We have designed a robotic car consist of mechanical design with electronically controlled wheels which can be operated through voice recognition by farmer through android watch which is connect with the robotic car with the help of interfacing in arduino board consisting of various sensors such as light sensor, moisture sensor, humidity sensor, temperature sensor, pressure sensor, pollution sensor, damage of crop sensor. The motion of the robot is forward direction as well the backward direction and both sideward. The device is fully designed when the crop is affected the notification is sent to the farmer through watch with the help of Bluetooth technology. So that the farmer can operate the robot through voice by saying the direction which is encrypted as numbers.

III. HARDWARE DESIGN OF THE CONTROL SYSTEM IN SMART VEHICLE

The hardware architecture of the smart vehicle’s control system is based on μC/OS-II. Figure 1 shows the main parts of this system. Intelligent car control system includes the following modules:

3.1. Control module: The control system of micro-controller uses NXP’s LPC2138. It is responsible for voice command signal, voice playback of encoded signals, LCD display, joystick control signal, the remote control signals, ultrasonic signals in case of impaired acquisition and DC motor PWM speed control signals, ultrasonic signals start to send, in order to achieve the functional modules global coordination and control.

3.2. LCD module: The control system uses SMG240128 LCD module as shown in human-computer interface. The driver uses sophisticated ZLG/GUI package. ZLG / GUI are developed by Zhou, which is a graphical user interface package. Color graphical interface is displayed on LCM, which is used C language that is easy to transplant. Features include basic.
geometry rendering, window manager, icons, menus, dropdown menu, English text display, the color conversion. Friendly interface can make the hardware and software debugging more concise, easier to control.

3.3. Voice recognition and playback module: Speech recognition and identification training phase is divided into phases: training phase of the task is to establish the basic unit of recognition acoustic model. Identification stage is to analyze the use of speech analysis speech feature parameters, according to certain criteria and measure compared with the system model, the recognition results obtained by the judge. The voice recognition module in the system is limited mainly to the five voice commands (forward, stop, backward, turn left, turn right order) to identify the judge, and the command signal is encoded by the I/O port to send to the main chip, the master chip signal processing for the command, call the appropriate subroutine to make the appropriate action to respond. Voice playback chip integrates voice signal amplification, filtering, sampling, A/D conversion module.

4.4. Joystick control module: It is mainly consisted by the multi-axis controller, joystick, hand brake switch, shift button, handle, and wires. It's driving the car moves, such as forward, backward, turn left, turn right and stop into a corresponding electrical signal through the ARM I/O port input. ARM receives a control command, calling the appropriate function. The PWM controls the signal, in order to achieve the car's motor drive control.

3.5. DC motor driver module: It uses ARM chip PWM pulse width modulator to drive DC motor, by changing the duty cycle of the PWM signal to the DC motor speed controller. Through the H-bridge circuit to the motor reversing control, the specific DC motor power drive circuit is shown in Figure 2. DC motor drive circuit uses a FET driver optically isolated, so that the DC motor will work with the ARM embedded system power supply to isolate the work to improve the ARM control system reliability and stability.

3.6. Motor speed detection module: Motor shaft speed feedback circuit detection system uses incremental optical encoder to detect the actual speed of DC motor. Optical encoder signals are generally VCC, GND, A, B and Z, where only the connected power and A signal, as the DC motor shaft position and velocity feedback signal. Pulse encoder feedback signal is got through opt coupler OC on the encoder output signals with internal pull-up resistor (Figure 3 R1). Through the RC filter after the signal sent to the ARM and to the external interrupt detection is good, to achieve the speed feedback. INTO, it is observed that, in the INTO, the interrupt service routine of the DC motor speed.

![Figure 2. Driver Module of the Motor](image)
IV. SOFTWARE DESIGN OF THE CONTROL SYSTEM IN SMART VEHICLE HARDWARE USED

1. Arduino board
2. Voice recognition system
3. LCD display
4. Light sensor
5. moisture sensor
6. humidity sensor
7. temperature sensor
8. pressure sensor
9. pollution sensor
10. damage of crop sensor
11. Head light
12. Motor

V. LCD DISPLAY

The LCD uses the HD44780 series LCD driver from Hitachi, or equivalent controller. The LCD is connected to a female 14-pin connector for easy interface with the BS2p24/40 Demo Board and the Professional Development Board.

**ARDUINO BOARD:**

EasyVR is the second generation version of the successful VRbot Module. It is a multi-purpose speech recognition module designed to easily add versatile, robust and cost effective speech recognition capabilities to virtually any application.

The EasyVR module can be used with any host with an UART interface powered at 3.3V – 5V, such as PIC and Arduino boards. Some application examples include home automation, such as voice controlled light switches, locks or beds, or adding “hearing” to the most popular robots on the market.
VOICE RECOGNITION CONTROLS:

Zero – “0” → Stopped
One – “1” → Runs in forward direction
Two – “2” → Runs in reverse direction
Three – “3” → Turns left
Four – “4” → Turns right
Five – “5” → Applies break
Six – “6” → Head light glows
Seven – “7” → Head light turns off

SOIL MOISTURE SENSOR:

It is used to check whether the moisture of the soil is according to the normal level of the actual crop or not. It is helpful for robot car to sense the moisture of the soil.

TEMPERATURE SENSOR:

It is used check the temperature of the crops and helps for the irrigation by notifying the farmer. Three pins are used in this sensor. Input, output, ground.

VII. CONCLUSION:

Comparing to the other technologies in agriculture, this system will help the farmer to do the work from whatever place they are. So that they can easily access the robot and do the operations. This paper designs a wireless system using arduino, sensor node as combination of sensors. So that the data will be analyzed transmitted and processed according to the voice command of the farmer which can be easily configured to run out the application. Since it is little high in cost but the outcome will more helpful for the environment. One best advantage in this system is low power consumption. Easy to handle, Flexible to wear and take to any places. But the distance of processing is smaller in this system. That’s the second disadvantage in this system.

FUTURE WORK

Future work will be designing this system with low cost so that in rural area also agriculture will be easier. And making the system to work on long distance so that the farmer can access the system at far distance also. Such a system is more useful in many environmental monitoring and processing.
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REFERENCE

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