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Agribot: Implementation of Adaptive PID in A Spray Bot

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Abstract: India is an agriculture based country. However, to achieve high performance and excellent quality, certain technical skills are required along with technological assistance. Pest spraying is an important task for every farmer. There is also the possibility of direct contact of pesticides with the human body, which will be harmful. This project will be designed as a pesticide spraying robot. A vehicle is made to realize the idea. The sprayer is mounted on the robot so that it can spray pesticides evenly covering a large area in a shorter time. The replacement of human labor with automation is a growing trend in many industries, and agriculture is not expected. Most aspects of agriculture are extremely labor intensive. much of this work consists of repetitive and standardized tasks. Using Adaptive PID, the robot detects an obstacle and effectively follows the path. The system shows that it can avoid obstacles, it is able to avoid a collision and it can change its position. Finally, there will be a useful project for our environment.

The Internet of Things (IoT) presents the possibility to collect continuous data about every physical activity. A special mechanism called a PID controller is used. A PID (proportional, integral, derivative) controller is a device used in industrial control applications to regulate temperature, flow, pressure, speed, and other process variables. The robot will be programmed and assigned a place. It will program it to work only in that location. Robotics is a branch of engineering that deals with concepts, design, manufacturing and operations. It includes multidisciplinary fields such as computer science, electronics, artificial intelligence and nanotechnology.

I. INTRODUCTION

In our country, approximately 215.6 million acres of land are irrigated crop areas. An economic survey says there is a need to improve farm mechanization in the country. As science grows so rapidly, the applications and requirements for using robotic cars are increasing at a tremendous pace. An important role is played by increasing the productivity control of pest infestation. Farmers face serious problems in managing pest infestations. Pests are unwanted insects or pathogens that interfere with human activity and can bite, destroy food plants or make life difficult for farmers. Early detection and avoidance of pests is a key point in crop management. Effective pest control requires some knowledge of pests and their habitats. Farmers are currently spraying their fields with pesticides. The main disadvantages of this method are: the pesticide can come into contact with the farmer during spraying, which can cause skin cancer and asthmatic diseases. The increase in the demand of manpower in agricultural fields is increasing day by day because people are less interested in agriculture today so all we need is a robot that can replace humans. Pesticide spraying plays a key role in field protection. Increased pesticide spraying may impact consumer health as they enter the food chain. Pesticides are also sometimes sprayed on unaffected crops, resulting in the same waste. We have therefore created an automated robotic system that can spray limited amounts of pesticides only when pests are detected to address the above issues. Not only does this save the farmer from life-threatening diseases and physical problems, but it also saves the farmer money due to reduced use of pesticides. This is why it helps the farmers and subsequently the nation in economic development.

IOT enables devices across the farm to measure all kinds of data remotely and provide this information to the farmer in real time. IOT devices can collect information such as soil moisture, chemical application, dam level and livestock health – as well as monitor vehicle fencing, weather, etc. This is an application of the joint implementation of connected devices and innovative technologies to agriculture. Smart Farming largely depends on the Internet of Things, thereby eliminating the need for physical labor by farmers and growers, thereby increasing productivity in all possible ways. AI systems help improve the overall quality and accuracy of harvests – known as precision agriculture. A PID controller is a device used in industrial control applications to regulate temperature, flow, pressure, speed, and other process variables. The advantage of the PID controller is its feasibility and easy implementation. A PID

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controller is used to design a line following robot. An array of multiple sensors detects the black surface and moves along the line. The Arduino Uno continuously monitors the signal from the sensors and rotates the robot when a line is detected. Obstacles are detected by an ultrasonic sensor. Line-following robots can be used in the military, intrusion alarm systems, and so on.

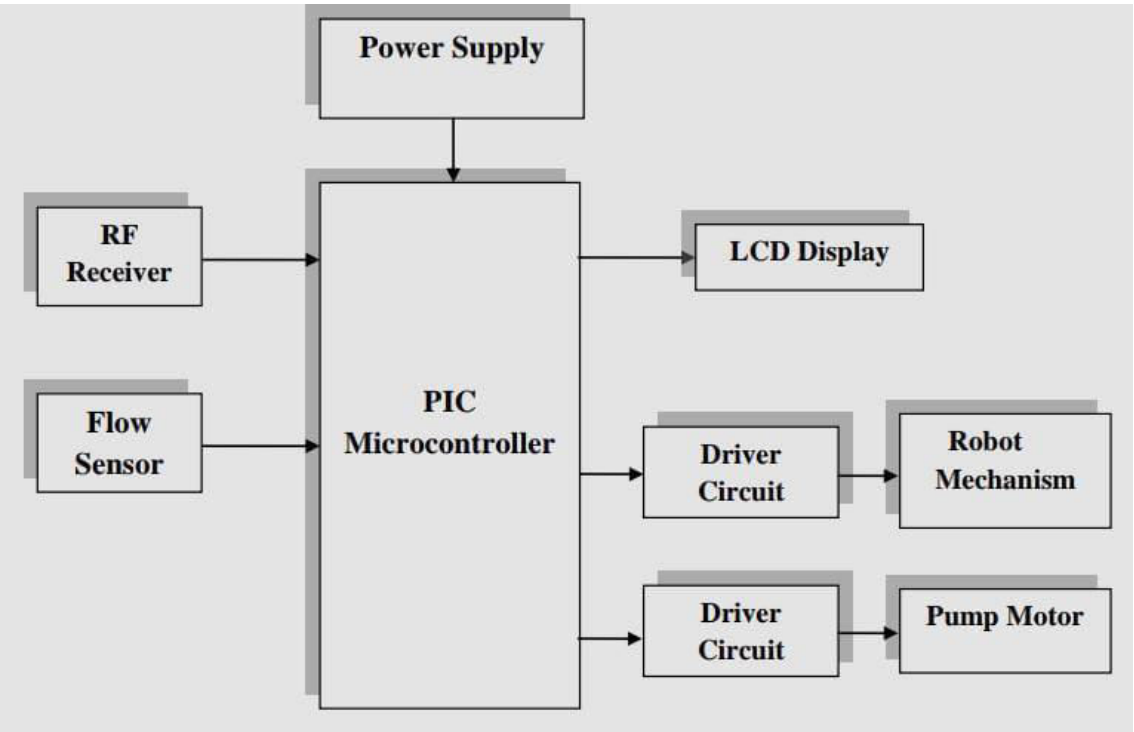
II. RELATED WORK

[1]"Smart agriculture using agrobots". It offers a system that does seeding in an agricultural field. The main idea of this development is to perform agricultural tasks without human intervention and to implement a prototype of an effective low-cost agrobot. This project is based on wireless communication using Arduino and Bluetooth.

[2]“IoT-Based Smart Agriculture – Making the Fields Talk”. It is an IOT based multi-tasking technology in agriculture. The idea behind this structure is to help farmers produce high-quality yields to meet the increasing demand for food with a growing population, using wireless sensors, UAVs, cloud computing and communication technologies. the system proposes complete technology-based farming from start to harvest that involves very little human interaction.

[3]“AGROBOT: Sowing and Irrigation Agricultural Machine” This system is controlled by an ARM CORTEX M3 based microcontroller. FC-28 is used for soil moisture detection. The LPC1769 microcontroller controls seeding and irrigation. The relay is used to perform the irrigation operation, the microcontroller sends a high signal when the moisture level is low and the relay is on. This prototype is built from aluminum square tubes and foam board to reduce weight. The main goal of this system is to help farmers with accuracy Agriculture.

III. PROPOSED METHOD



The PID adaptive control algorithm is widely used in the field of mobile robots, but the application in the greenhouse spraying robot is relatively less. According to the requirements of our project, the following part mainly analyzes the operation characteristics of the greenhouse and applies adaptive PID control to the trajectory and spray control system of the spraying robot. First, by monitoring the values of water flow through the pipeline

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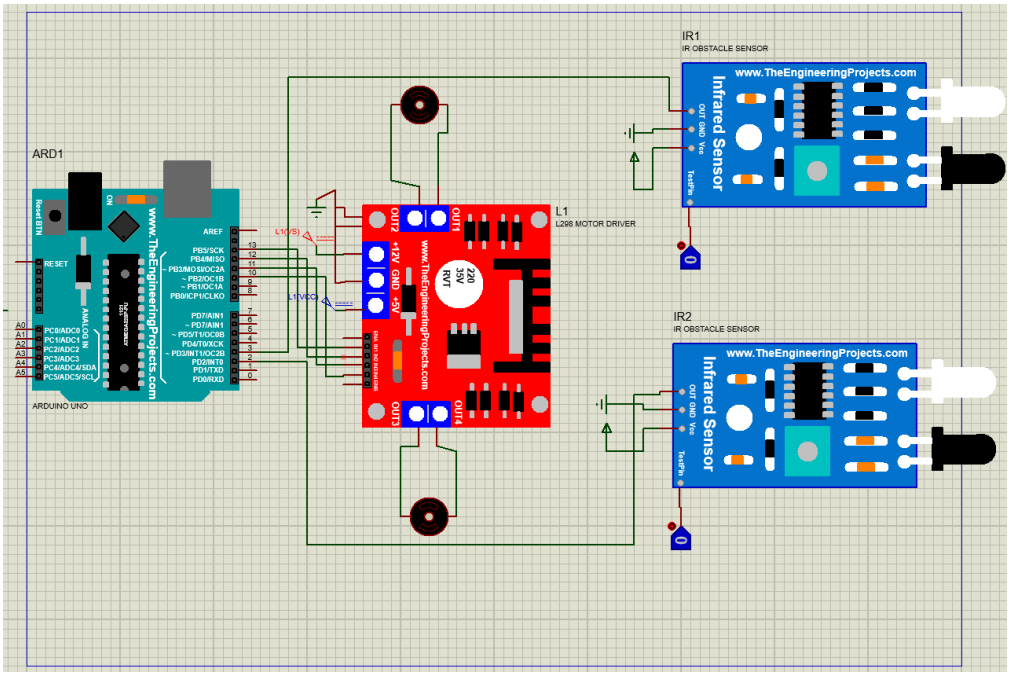
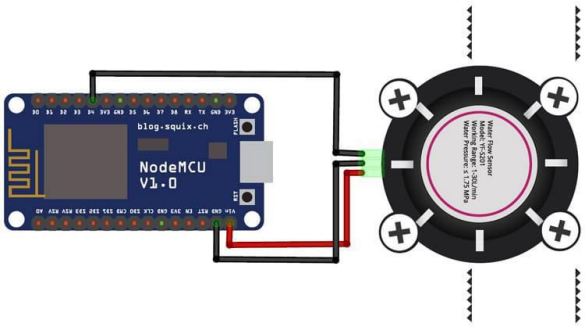
to get the actual value, the controller compares it with the set flow value, then makes the controller inputs flow error e (k) and error rate ec (k); Second, it is transformed into a set of values; Third, then the controller will get the incremental value of the control amount, then the controller will get the net value to adjust the speed of the miniature pump so that the water flow value is in accordance with the set value. The spray robot is controlled using RF communication using a keyboard connected to a microcontroller. The flow sensor is used to measure the water flow and according to the set value, the water flow is kept within limits. A worldwide network of interconnected computer networks based on a standard communication protocol, the Internet suite (TCP/IP), where a thing is an object that cannot be precisely identified. This agricultural robot reduces the general attempts of farmers and also improves the speed and accuracy of work. This robot was created to improve application accuracy and yield. A Node MCU is used as a microcontroller. Only the Node MCU controls the live video movement, spray impact and robot movement.

IV. METHODOLOGY



A proportional-integral-derivative controller (PID controller or ternary controller) is a feedback control loop mechanism that is widely used in industrial control systems and a variety of other applications requiring smoothly modulated control. The PID controller continuously calculates the error value.



A radio frequency (RF) signal refers to a wireless electromagnetic signal used as a form of communication. The spray

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robot is controlled using RF communication. The flow sensor is used to measure the water flow and according to the set value, the water flow is kept within the limit. The solar panel generates direct current which is connected to the battery through an auxiliary circuit and a charge controller to keep the battery charged. A four-wheeled vehicle is made to transport the pesticide container. DC motors are connected to the wheels to move the vehicle through the motor drive. They used a 3W solar powered board where the output from the panel is around 9.5V using a booster circuit the output is increased to 12V and connected to a battery powered battery. The framework uses an Arduino microcontroller that is on an ATmega 328. An adapter circuit is used to split the voltage into 12V and 5V to get 5V for the Arduino and 12V for the DC motor. Arduino UNO has an operating voltage of 5 V. To move the entire system, a 60 rpm 12 V DC motor is used, which is controlled by IC L293D, and the LCD is used to display the status of the device. They use a 16 x 4 LCD display. GSM is used to communicate with the robot via SMS. The relay circuit serves to introduce the necessary separation required by the rover and further sends a signal for the operation of the DC pump. An ultrasonic sensor is used to detect objects/obstacles. When moving along a predefined path, in the presence of obstacles in the way, the robot stops to avoid damage and communicates via SMS. The motor driver is used to drive the motors as indicated by the data provided by Arduino. A sprayer sprays pesticides through a nozzle.

IV. CONCLUSION AND FUTURE WORK

This set out a vision of how aspects of crop production could be automated. Although existing manned operations can be effective over large areas, there is potential for reducing the extent of treatment using autonomous machines, which can lead to even greater efficiency. The development process may be incremental, but the overall concept requires a paradigm shift in the way we think about mechanization for crop production, one that is based on plant needs and new ways of meeting them rather than modifying existing techniques. The Internet of Things is the expansion of current Internet services to suit every single object that exists in this world or is likely to exist in the coming future. Things with identities and virtual personalities operating in smart spaces using intelligent interfaces to connect and communicate within social, environmental and user contexts. This project discusses the perspectives, challenges, and opportunities of a future Internet that fully supports "things," as well as how those things can help design a more synergistic future Internet. Internet of things like loT can be divided into two parts Internet and Things.

Traditional farming has to be induced by robotic mechanism and is highly required in precision agriculture. As agricultural robots have already entered the agricultural sector, there would also be demobilization in agriculture. Remote-controlled robots would roam the agricultural fields to control the herd. With the introduction of agricultural robots, less labor would be required and an individual can plan and execute farm operations by himself without depending on the availability of labor.

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