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AI BASED AUTOMATED HARVESTING MULTIPURPOSE AGRICULTURAL ROBOT

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ABSTRACT

Artificial Intelligence is gaining popularity day by day. Right from Industrial Automation to Software to manufacturing, Artificial intelligence is making its way. However, the agricultural practices used even today are far away from the deployment of AI for the benefit. People still follow the obsolete agricultural practices. The harvesting operation is carried out manually which involves if the fruit or vegetable is ready for harvesting and then farmers pluck the fruit or vegetables in the farm. The majority of the agricultural operations are performed manually by the farmers using agricultural labor or by using mechanized agricultural equipment's. This project proposes the concept of use of artificial Intelligence and robotics for agricultural operations including multiple applications for day-to-day farming activities. The proposed project consists of a Robotic vehicle navigating through the field and determining if the fruits or vegetables in the farm are ready for harvesting. The proposed system also implements AI based Harvest assistance. The robot moves over the field scanning if the agricultural produce is ready for harvesting. The camera mounted on the robotic vehicle detects if the agricultural produce is ready for harvest. If it is detected to be ready for harvesting, the robotic arm present on the vehicle automatically harvests the produce and collects. Thus, the system provides automated harvesting for farmers.

Keywords: *Artificial Intelligence, multipurpose robot*

I. INTRODUCTION

One of the important sectors of Indian Economy is Agriculture. Employment to almost 50% of the countries workforce is provided by Indian agriculture sector. India is known to be the world's largest producer of pulses, rice, wheat, spices and spice products. Farmer's economic growth depends on the quality of the products that they produce, which relies on the plant's growth and the yield they get. India is the land of villages. This being said the major occupation of majority of villages in India is agriculture. Near about 70% people are dependent upon agriculture. Agriculture has been the backbone of the Indian economy and it will continue to remain so for a long time. It has to support almost 17 per cent of world population from 2.3 per cent of world geographical area and 4.2 per cent of world's water resources. The economic reforms, initiated in the country during the early 1990s, have put the economy on a higher growth trajectory. Annual growth rate in GDP has accelerated from below 6 percent during the initial years of reforms to more than 8 percent in recent years. This happened mainly due to rapid growth in non-agriculture sector. The workforce engaged in agriculture between 1980-81 and 2006-07 witnessed a very small decline; from 60.5 percent to 52 percent.

Research in agricultural robots has been growing in the last years, thanks to potential applications and industry efforts in robot development. Their role was investigated for many agricultural tasks, mainly focused in increasing automation of conventional agricultural machines and covering processes such as ground preparation, seeding, fertilization, and harvesting. Systematic, repetitive, and time-dependent tasks seem to represent the best fields of application for robots, especially in an arable farming context with temporary crops. Beside agronomic practices, robotic plant protection has also been investigated, but may represent the most complex challenge for researchers Sustainability.

Robotics in agriculture is still a field of wide research and not implemented on practical scale as agriculture still follows obsolete methods. This not only brings down the agricultural produce but also provides a lot of physical as well as mental pressure on farmers. The crops or the agricultural produce is harvested manually which is again a hectic task to collect every vegetable and fruit. This project deals with the concept of AI Based Automated Harvesting Multipurpose Agricultural Robot.

II. LITERATURE REVIEW

The project a brief literature review was done regarding the solutions available in the market. Additionally the number of research papers by different research scholars are also studied to arrive at the scope of the project.

G. Sandhi et al., in [1] have proposed visually guided operations in green-houses. In this project they have developed a vision-based system for tomato farming. They have used two PAL cameras which has the work of sending the signals to the server for fast processing of images. These cameras are high resolution cameras which captures the images and send it for the processing unit.

K. Rangan et al., in [2] have discussed An Embedded Systems Approach to Monitor Green House. To monitor and control the greenhouse parameter they developed this system. In this system they have monitored temperature and humidity of the green house. Also, PH of water and moisture of soil they have monitored. In this they have used GSM system to send the msg to the farmer/owner of that green house. These messages are sent in particular format that is difficult to understand for il-literals.

Wei Ai et al., in [3] have proposed Green House Environment Monitor Technology Implementation Based on Android Mobile Platform. They proposed this system to monitor temperature and humidity, in this they have used cable type sensors. Data collected from sensors are send to the used via GPRS. They have overcome the problem of range limitation. But for the GPRS system the network facility should be provided. If the Network becomes unavailable the data could not be send to the user

Akshay et al., in [4] have proposed Wireless sensing and control for precision Greenhouse management. In this system they have used ZigBee for wireless communication. And control processing unit for monitoring. This system aims to monitor and control temperature and humidity of greenhouse. Data collected from the sensors are sent to the CPU for monitoring using the wireless communication technology. The main disadvantage of this system is the range of ZigBee. It provides the range of 10 to 100 meters only.

Aji Hanggoro et al., in [5] have discussed Green House Monitoring and Controlling Using Android Mobile Application. This system is developed for indoor farming to monitor the humidity. They have used android phone which is serially connected to the microcontroller humidity sensor. They have used Wi-Fi technology to

send the data to user. The disadvantage of this system is range because the Wi-Fi provide very low range.

S. Thenmozhiet al., in [6] have discussed Greenhouse Management Using Embedded System and ZigBee Technology. In this system the monitoring process takes place in two modes automatic and manual. The status of the system is send using Wi-Fi. All activities of the system is managed from control room. Activities are controlled through PC M.K.

Halil Durmas, in [7] have proposed the Design of General-Purpose Autonomous Agriculture Mobile-Robot "AGROBOT". They have developed this system for increasing crop productivity. This AGROBOT is able to process and monitor the farm. This robot also capable of doing all the farming activities like spraying, cutting, monitoring, analysing, productivity calculation.

Amir H. in [8] have designed Automatic Weed Detection and Smart Herbicides Sprayer Robot for Corn Fields. This system they have classified plant and weed according to their attributes and properties and for this they have used machine vision algorithm. The sprayer are told to spray right on desired spot.

III. METHODOLGY

The actual fabrication of the proposed work begins the material survey, to be made to select the appropriate materials for the entire project. The second step is to layout a proper plan for the project so that project can be caarried out in stages. Based on the concept of the project the following material was needed to the completion of the project.

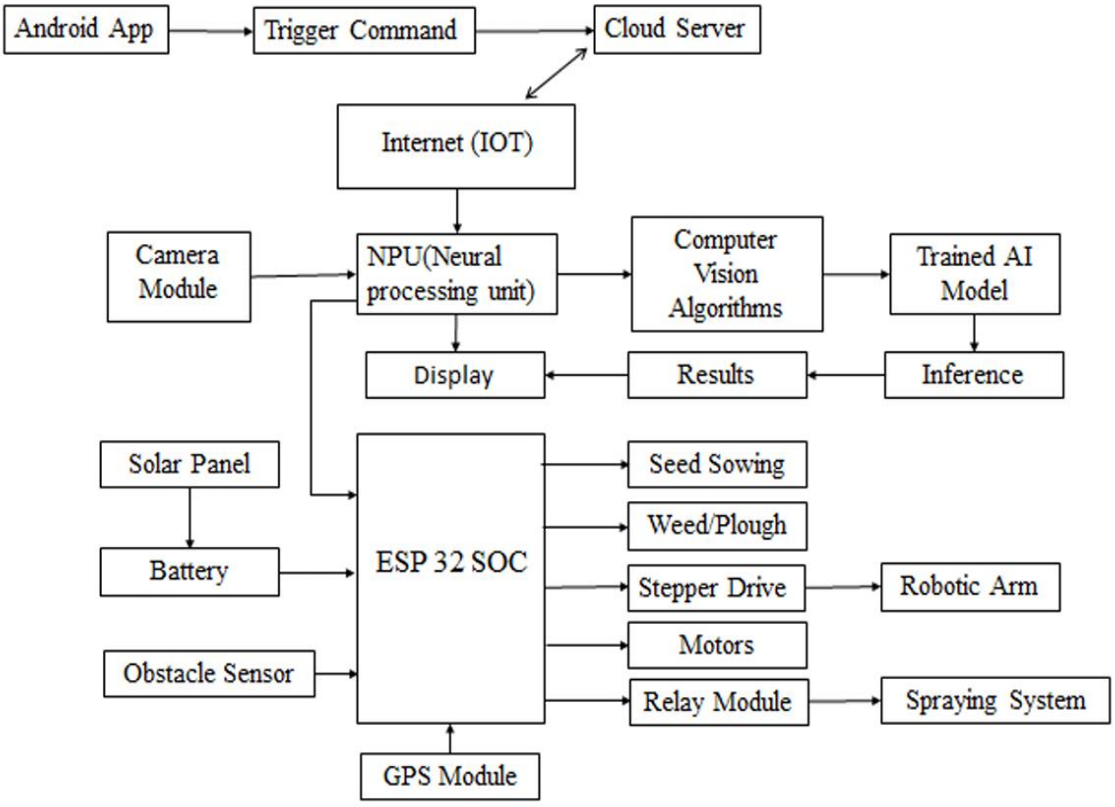

Fig. 3.1: AI Based Automated Harvesting Multipurpose Agricultural Robot

The project involves used of AI for the determination and analysis of crops to be harvested in the field. The proposed project consists of a Robotic Vehicle which can move across the field, scan for the crops and then

detect if the fruits and vegetables are ready for harvesting using computer vision and artificial intelligence. The proposed set up consists of a Robotic vehicle as shown in the figure with the camera mounted on the top of it. When triggered the robotic vehicle can be move autonomously thought the field. The overhead camera can scan the field of crops and use deep learning systems to determine if the plants contain fruits or vegetables ready for harvest. If the fruit or vegetable is ready for harvesting the robotic vehicle captures the coordinates of the detected fruit or vegetable and sends it to the robotic arm based harvesting system. The robotic arm present on the harvesting robot will use forward kinematics equation to move to exact coordinates of the detected fruit and harvest the fruit/vegetable if it is ready for harvesting. Additionally, the developed system is also capable of performing day to day agricultural operations such as sowing, Spraying, weeding and ploughing to help the farmer in day-to-day activities. The IOT based application developed can be used by the farmers to trigger the Robot for a particular operation using IOT protocols from home itself. The proposed project performs navigation autonomously there by making it a full-fledged futuristic solution to the currently existing problems. Additionally, since the robot is solar powered, it is green and eco-friendly and doesn't require any external Aid of power.

IV. METHODOLOGY

FLOW CHART

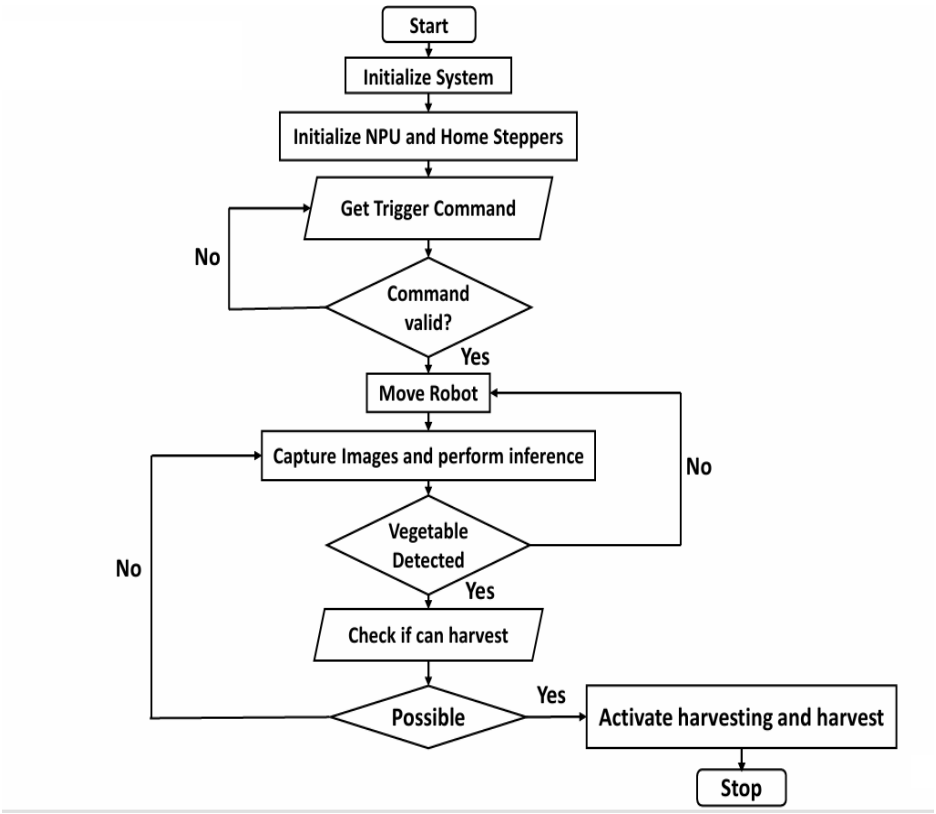

Fig. 4.1 Flow Chart of the work.

V. RESULT

Once have created and evaluated your model, see if its accuracy can be improved in any way. This is done by tuning the parameters present in your model. Parameters are the variables in the model that the programmer generally

decides. At a particular value of your parameter, the accuracy will be the maximum. Parameter tuning refers to finding these values.

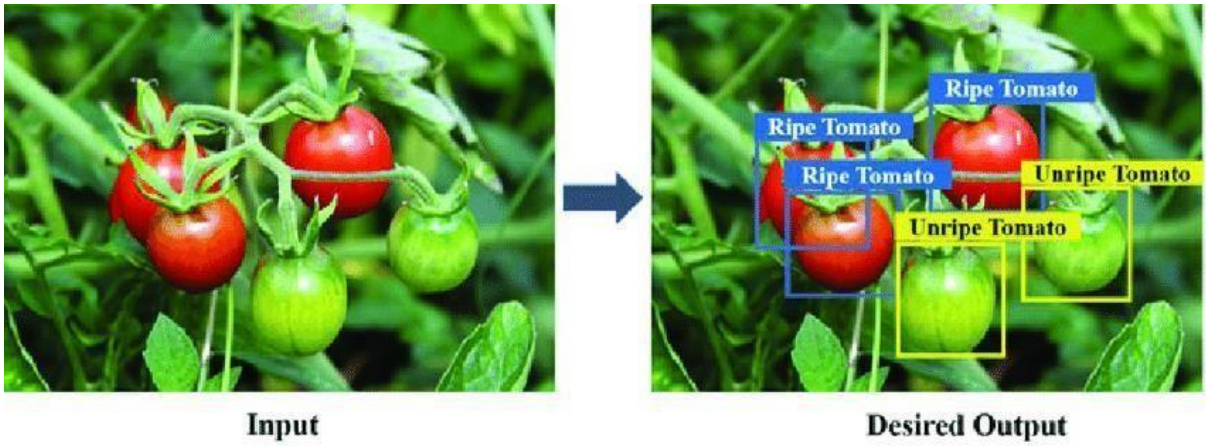

Figure 5.1: Performing interference with using trained model

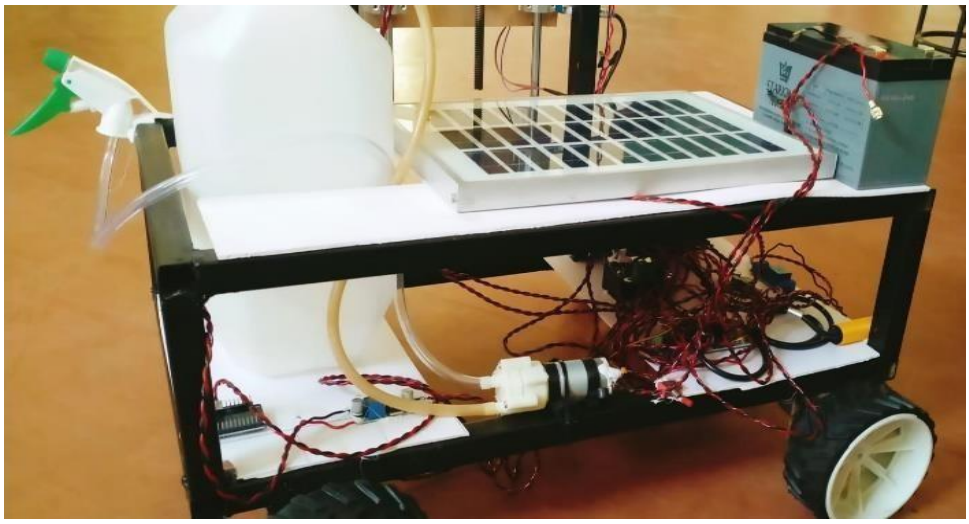

Fig 5.2: Working model

VI. CONCLUSION

The project deals with the concept of AI based automated harvesting multipurpose agricultural robot which can be used by farmers for automated harvesting as well as day to day operations. The proposed project is expected to provide the farmers with an advanced tool using AI which can be used to automatically detect the fruits/vegetables to be harvested and use precision robotic arm with coordinate positioning system to harvest it if required. This project is controlled autonomously by providing a trigger command over the IOT control panel developed which is hosted on the cloud. This will permit the farmers to trigger the agricultural operation in the field from the comfort of their home using android application as well as web application. This is expected to reduce the burden on the farmers or physical stress on the farmers. The project is also capable of spraying, seed sowing, weeding and ploughing autonomously in a single machine thus helping the farmers also perform day to day operations using single machine and without human intervention. The entire project is solar powered making it clean, green and cost free for farmers to operate. Thus, the project is expected to provide farmers with a

single machine which is capable of using the power of AI to perform on field operation autonomously.

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