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# Design and Development of an Automated Nozzle System to Spray in Agriculture Use

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**ABSTRACT:** Smart technology in Agriculture is a need in modern society, especially to cope with the vacancy of skilled labour moreover the demand for food, cloth, and other agricultural resources has been increasing day by day. The agricultural revolution or Green Revolution is something everyone is familiar with and due to increased demand for Agricultural products in the developing world, there is a lot of scope for it. The nozzle system that is built by us is a simple smart technology using the simple products available in the market. The aim is to cope with the lack of skilled labour that is required to spray seasonal long-term crops like coconut, areca nut, cocoa, etc. The nozzle system is a smart IOT based that can be fixed to any drone it can be UAV or UGV and can be controlled easily.

This design is a small-scale prototype that can still be improved and used on a large scale to meet up with the requirement of the present agricultural system. This is cost effective user friendly which was our primary goal and we were able to reach. The nozzle system uses an open-source nozzle that can both inject and spray. This option can be done using a screw mechanism, by using the bevel gear mechanism this system is automated. Based on the literature survey done by using the field of Agricultural technology has a very large scope and it is still under development. Moreover, even the Governments of various countries are focusing on reliability of the Agricultural technology to meet the growing population. The aim of the design is to obtain a cost-effective, working prototype, and practical design of an automated nozzle system to spray in Agricultural use.

**KEYWORDS:** smart technology, green revolution, IOT based, Automated nozzle system, UGV, UAV

## I. INTRODUCTION

Automated Nozzle systems are used in various fields like fire departments, turbines, Agriculture, painting, etc. The design presented here is a design that is aimed to be used for Agricultural purposes. The Agricultural revolution or the green revolution has given a lot of scope to Agricultural technology and Governments have been aiming for the improvements of such technologies. They are focussing on the development, reliability, user-friendly, and cost-effective products in the market. The scope of the product that is designed is vast because this system can be used for various crops and various purposes. Agriculture is a sector that plays an important role in the economy of a country and the peace of the world. The constant development of this is very important in order to meet the requirements of the existing and growing population. Pest control and nutrition supplement are the major steps that need to be done timely in order to have an efficient crop every year. This design helps to complete both roles more easily. Due to industrialization and demand in the IT sector, the skilled labor required for these works has been decreasing at a very large rate. To cope with this problem various technology have been into existence. This design helps in coping with the problem of spraying the pesticide on the crops that are present in trees. The scope for the product to development is very high because this design is just a prototype and the existing automated spray system is created for seasonal plant crops like paddy corn etc.



## II. COMPONENTS

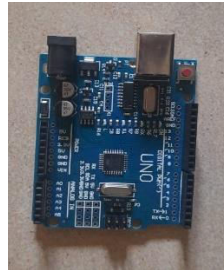


Fig 1 Arduino uno R3

The Arduino UNO is an ATmega328P-based microcontroller board. It contains 6 analogue inputs, a 16 MHz ceramic resonator, 14 digital input/output pins (six of which can be used as PWM outputs), a USB port, a power jack, an ICSP header, and a reset button. It comes with everything required to support the microcontroller; to get started, just use a USB cable to connect it to a computer or an AC-to-DC adapter or battery.



Fig 2 Servo-motor

A servo motor is a kind of motor that has extremely precise rotational capabilities. This type of motor typically has a control circuit that gives feedback on the motor shaft's present location. This feedback enables the servo motors to rotate very precisely. A servo motor is used to rotate an object at predetermined angles or distances. It consists only of a straightforward motor that drives a servo mechanism.



Fig 3 Bevel Gear

The tooth-bearing sides of bevel gears have a conical form and are located where the axes of the two shafts connect. Although they can be made to function at other angles as well, bevel gears are typically installed on shafts that are 90 degrees apart. A pitch cone is the shape of the pitch surface of a bevel gear. Bevel gears are quite beneficial in machines that are frequently utilised in mechanical settings because they convert linear energy into vertical power.



Fig 4 Bluetooth Module

Information for the HC-05 module

- The red LED on the HC-05 shows the connection state, whether Bluetooth is active or not. This red LED continually and irregularly blinks before being connected to the HC-05 module. It blinks for two seconds when it is in Bluetooth range of any other device.
- On 3.3V, this module operates. Since the module contains a built-in 5 to 3.3 V regulator, we may also connect a 5V supply voltage.
- There is no need to change the transmit level of the HC-05 Bluetooth module because it has a 3.3V level for RX/TX and the microcontroller can detect that level. However, we must change the microcontroller's transmit voltage level to the HC-05 module's RX.
- The range of the HC-05 module's data transfer rate is 10 metres, with a maximum variation of 1Mbps.



Fig 4 Pump

A submersible pump (or electric submersible pump (ESP)) is a device that features a hermetically sealed motor tightly coupled to the pump body. The entire assembly is immersed in the liquid to be pumped. The main advantage of this type of pump is that it prevents pump cavitation, a problem associated with a large difference in height between the pump and the liquid surface. Unlike jet pumps, which create a vacuum and rely on atmospheric pressure, submersible pumps push liquid to the surface. Submersibles use pressurized fluid from the surface to power a hydraulic motor instead of an electric motor downhole, and are used in heavy oil applications with heated water as the propulsion fluid.



Fig 6 Base



This is the platform for the Nozzle to stand and rotate



Fig 7 Nozzle

This Faithfull Adjustable Spray Nozzle can be adjusted from a fine spray to a powerful jet by quickly twisting the brass nozzle end. The spray pattern can be set to a fine spray for delicate garden plants or a powerful jet for patio, patio or vehicle cleaning. Made from high quality solid brass. Suitable for use with all 12.5mm (1/2") ID hose and compatible with all other UK water fittings.



Fig 8 Flowrate Sensor

Flow Sensor or detectors are a class of device that's designed to measure the inflow rate of a gas similar as air or a liquid through a pipe or conduit. Flow dimension is important for the control of numerous artificial processes and for the operation of ministry at optimum situations of performance and effectiveness. motorcars use inflow detectors to measure the air input to the machine and acclimate the energy delivery to fuel injectors so as to achieve the asked energy admixture to the machine. Medical ventilators use inflow detectors to establish the correct rate of delivery of air or oxygen to cases for backing with respiration.

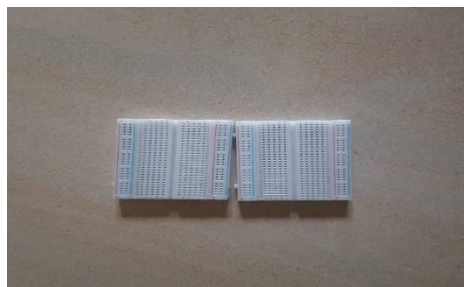


Fig 9 Breadboard

A breadboard, solderless breadboard, or protoboard is a construction base used to makesemi-permanent prototypes of electronic circuits. Unlike a perfboard or stripboard, breadboards don't bear soldering or destruction of tracks and are hence applicable. For this reason, breadboards are also popular with scholars and in technological education. A variety of electronic systems may be prototyped by using breadboards, from small analog and digital circuits to complete central processing units (CPUs).

Compared to further endless circuit connection styles, ultramodern breadboards have high parasitic capacitance, fairly high resistance, and lower dependable connections, which are subject to shoulder and physical declination. Signaling is limited to about 10 MHz, and not everything works duly indeed well below that frequency.

### III. RESULT



Fig 10 and 12 AUTOMATED NOZZLE SYSTEM TO SPRAY IN AGRICULTURE USE

Automated nozzle system to spray in agriculture use has been designed and the prototype has been developed

#### Working principle

It is a IOT based system that works on servo mechanism and bevel gear system in order to have independent rotation of the nozzle and to provide spray and injection conveniently.

#### OBSERVATION

The flowrate varies from 19 to 24 l/min depending on the density of the fluid

### IV. CONCLUSION

An automated nozzle system to spray in agriculture use has been a successful prototype to demonstrate its wonders. It matched the condition that was initially proposed before the building of the nozzle is cost-effective and user friendly and it was able to meet it. There are a lot of drawbacks and areas that need to be observed and the scope of research for this product is very vast. There are a lot of opportunities available in order to have a very innovative product for South Indian farmers, especially because of the long-term crops that require these kinds of mechanized drones.

One of the major concerns of this kind of product is reliability. The reliability of the product needs to be increased. Maintenance of the product is another issue that needs to be addressed because after the application the attention in cleaning and storage.

Overall due to the agricultural revolution and increase in demand, this product can be developed further for mass production by consumers.

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