INVESTIGATION ON AUTONOMOUS PESTICIDE SPRAYING ROBOTIC VEHICLE IN AGRICULTURE FIELD

[1]Mr.Manikandan Ganesan, [2]Mrs.Ishwarya K. R, [3]Mr. Demoz Lisanework,
[4]Mr.Ayenachew Hailu Mengiste

[1,2,4] Lecturer, Department of Electromechanical Engineering, Hawassa University, Hawassa, Ethiopia

[3] Head of the Department, Department of Electromechanical Engineering, Hawassa University, Hawassa, Ethiopia

E-mail-id: mani301090@hu.edu.et, ishwarya.raghav@gmail.com, demoz0504@gmail.com, ayenachewhl@gmail.com,

Abstract:

As we all aware that the Agriculture is an extremely important in our developing countries like India. In earlier times crops got infected with insects and other factors in less amount. but today crops are affecting with several diseases and insects, so pesticides are sprayed by manpower to crops. The time required to spray is long and it is not possible to cover a full field with human power. Here we found a solution to spray the crops with less time and efficiently at low cost. This proposed work is to bring an autonomous robot that can spray the pesticides to the crops without any side effects on farmers. In this work an autonomous robot is developed to save the crops and pesticides.

Keywords: Robot, autonomous robot, agriculture robot, spraying robot, pesticide sprayer

INTRODUCTION

Agriculture is the backbone of India 18% of Gross domestic products come from agriculture. India is the largest producer of pulse, grain, wheat, spices & spice products. There are used in various medical applications [1,3]. The main role in agriculture is preventing the crops without affecting by insects and diseases. To prevent the crops from infecting, pesticides are used. It is not possible to spray a large amount of area in a short period in the routine by a man. Here the Autonomous robot can do this in less time and repeatedly [2]. Autonomous Robotic vehicles are the next form of Automation robots.it is a small type of Rover. Rovers are often used in the field of space and research.it can easily travel from one place to another place. This autonomous robot has the ability to guide itself or control it on its own [4]. This robot is customizable according to our purpose. it is a combination of electronic and mechanical components [6-11]. This robot travel by using the global positioning system (GPS) to spray the crops. The main difficulty involved in spraying pesticides is poison used to kill the insect will affect the health of farmers. sometimes it leads to death when high toxic pesticides are inhaled by the farmer while spraying. And another difficulty is routinely spraying, some crops need pesticide regularly in a period [12-16]. if those crops are not sprayed regularly, they get affected by the disease and lead to failure in the cultivation of crops. our proposed work helps to solve these problems by implementing an autonomous robotic vehicle for spraying pesticides to crops [17-19]. The proposed work was carried out by the concept of rover and autopilot system. This Autonomous robot is controlled by a PX4 Autopilot system. To operate the robot a mission is planned, and waypoints are fixed in the GCS software and uploaded to the robot via the telemetry system. When the mission is uploaded, Robot starts executing the waypoints and starts spraying the pesticides to the crops [20-25].
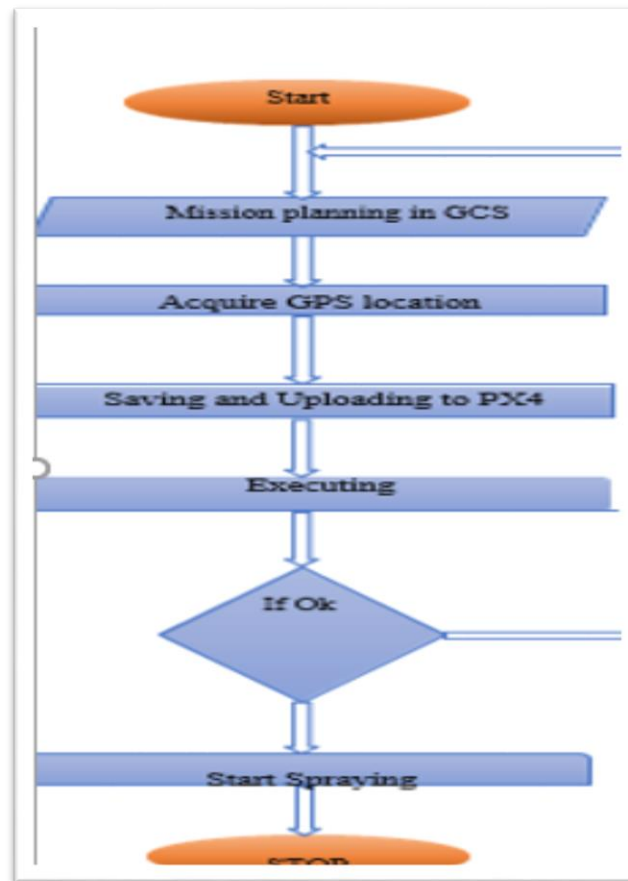
Figure 1: Flowchart diagram

DESCRIPTION OF PROPOSED SYSTEM

PX4 System:

PX4 system consists of 32-bit ARM CORTEX M4 core with FPU processor and 32-bit failsafe co-processor. The whole system of this robot is controlled by this unit it acts as a brain of the robot. It consists of the following sensors. A Telemetry system is a communication device that is used to communicate with the robot and the Ground control station. It consists of two modules namely RX & TX Module. RX module is fixed in the robot and the TX module is plugged in the computer or laptop used in the ground station Global Positioning System (GPS), is a popular device with a ceramic patch antenna that provides high performance also inbuild with onboard memory chip. Power module delivers the power to the PX4 system (5v). it consists of BEC (battery elimination circuit) to prevent short circuits and over- voltage and regulates the power to the system. A geared motor is a dc motor attached with an external gearbox to control the speed of the motor also to increase the torque. Here 12v rated gear motor is used to drive the vehicle with the rpm of Sprinkler motor Sprinkler motor is nothing but it is just a motor used to spray the pesticides. This sprinkler is attached in the robot vehicles with pesticide containers when the mission starts it automatically starts the sprinkler. This is controlled by the PX4 system through the Auxiliary output [5]. This software is otherwise called a ground control station (GCS) which is used to configure and planning the mission of the robot. For every mission, this software will be used for monitoring purposes each data of the robot is displayed in this software via the telemetrysystem.
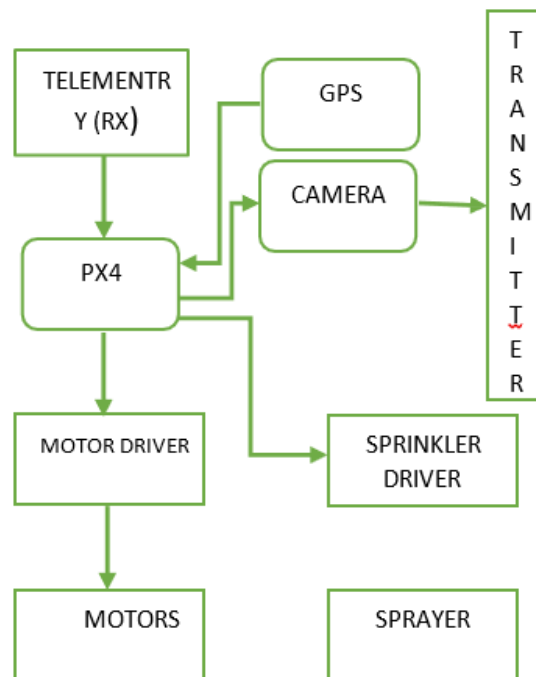
FIGURE 2: SYSTEM BLOCK DIAGRAM
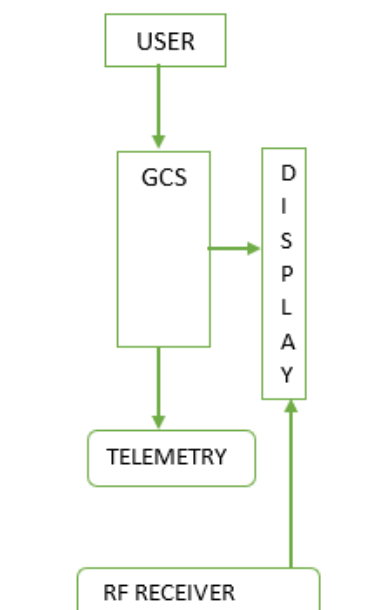
GCS BLOCK DIAGRAM

Fig.5 GCS block diagram

CONCLUSION

The experiment showed that the Robotic vehicle can complete the autonomous mission and sprayer requirements in the field. The PX4 system performed with perfect stability and great processing speed while doing the mission. The height of the spraying mechanism can be adjusted according to the corresponding crops in the field. This spraying mechanism is fully automated.

REFERENCES

1. Aishwarya.B.V, Archana.G and C. Umayal, "Agriculture robotic vehicle based pesticide sprayer with efficiency optimization," 2015 IEEE Technological Innovation in ICT for Agriculture and Rural Development (TIAR), Chennai, 2015, pp. 59-65.
2. J.R. Rosell, R. Sanz, "AReview of Methods and Applications of the Geometric Charactersization of Tree Crops in Agricultural Activities", Comput.Electron. Agric., vol. 81, pp. 124-141, Feb. 2012.
3. Y. Kumari, G. Kaur, R. Kumar, S.K. Singh, M. Gulati, R. Khursheed, A. Clarisse, K. Gowthamarajan, V.N. Karri, R. Mahalingam, D. Ghosh, Gold nanoparticles: New routes across old boundaries, Adv. Colloid Interface Sci. 1 (2019 Dec) 2102037.
4. S. Gupta, Inhibitory potential of Yucca gloriosa L. extract and isolated gloriosaol isomeric mixture on ovalbumin induced airway hyperresponsiveness in Balb/C mice, Clinic. Pharmacol. Biopharmaceut. 2 (2014).
5. D. Ghosh, S.K. Singh, R. Khursheed, N.K. Pandey, B. Kumar, R. Kumar, Y. Kumari, 289 G. Kaur, A. Clarisse, A. Awasthi, M. Gulati, Impact of solidification on micromeritic properties and dissolution rate of self-nanoemulsifying delivery system loaded with docosahexaenoic acid, Drug Dev. Ind. Pharm. 46 (4) (2020 Apr 2) 597–605.
6. S. Som, S.K. Singh, G.L. Khatik, B. Kapoor, M. Gulati, G. Kuppusamy, N.K. Anandhakrishnan, B. Kumar, A.K. Yadav, R. Kumar, P.K. Singh, Quality by Design-Based Crystallization of Curcumin Using Liquid Antisolvent Precipitation: Micromeritic, Biopharmaceutical, and Stability Aspects, Assay Drug Dev. Technol. 18 (1) (2020 Jan 1) 11–33.
7. G. Kaur, S.K. Singh, R. Kumar, B. Kumar, Y. Kumari, M. Gulati, N.K. Pandey, K. Gowthamarajan, D. Ghosh, A. Clarisse, S. Wadhwa, Development of modified   apple

polysaccharide capped silver nanoparticles loaded with mesalamine for effective treatment of ulcerative colitis, J. Drug Delivery Sci. Technol. 1 (60) (2020) 101980.

8. G. Barluenga, F. Hernandez-Olivares, Cracking control of concretes modified with short AR-glass fibres at early age. Experimental results on standard concrete and SCC, Cem. Concr. Res. 37 (12) (2007) 1624–1638.

9. O. Eyercioglu, A.S. Anwar, K. Gov, N.F. Yilmaz, The 2D Finite Element Microstructure Evaluation of V-Shaped Arc Welding of AISI 1045 Steel, Metals 7 (2017) 41.

10. Ganesh Babu Loganathan, Praveen M., Jamuna Rani D., "Intelligent classification technique for breast cancer classification using digital image processing approach" IEEE Xplore Digital Library 2019, Pp.1-6.

11. M. Viswanathan, Ganesh Babu Loganathan, and S. Srinivasan, "IKP based biometric authentication using artificial neural network", AIP Conference Proceedings (2020), Volume 2271, Issue 1, pp 030030.

12. Mohammed Abdulghani Taha and Ganesh Babu Loganathan, "Hybrid algorithms for spectral noise removal in hyper spectral images" AIP Conference Proceedings (2020), Volume 2271, Issue 1, pp 030013.

13. Dr.Idris Hadi Salih, Ganesh Babu Loganathan, "Induction motor fault monitoring and fault classification using deep learning probablistic neural network" Solid State Technology(2020), Volume 63, Issue 6, PP No. 2196-2213.

14. Ganesh Babu Loganathan "Design and analysis of high gain Re Boost-Luo converter for high power DC application", Materials Today: Proceedings(2020), Volume 33, Part 1, PP 13-22.

15. Ganesh Babu Loganathan, Dr.E.Mohan, R.Siva Kumar, " Iot Based Water And Soil Quality Monitoring System", International Journal of Mechanical Engineering and Technology (IJMET)(2019), Vol.10 Issue No.2, P.No. 537-541.

16. Suganthi K, Idris Hadi Salih, Ganesh Babu Loganathan, and Sundararaman K, "A Single Switch Bipolar Triple Output Converter with Fuzzy Control", International Journal of Advanced Science and Technology, (2020), Vol. 29, No. 5, (2020), P.No.. 2386 – 2400.

17. Ganesh Babu Loganathan, "Can Based Automated Vehicle Security System", International Journal of Mechanical Engineering and Technology (IJMET)(2019), Vol.10 Issue No.07, P.No. 46-51.

18. Ahmed Samir Anwar A Study Of Estimating The Amount Of Corrosion To Steel Plates Of Oil Storage Tanks In Bai-Hassan Oil Field In Kirkuk International Journal of Mechanical and Production Engineering Research and Development (IJMPERD) ISSN (P): 2249–6890; ISSN (E): 2249–8001 Vol. 9, Issue 6, Dec 2019, 378 1–1

19. G. Sai Krishnan, L.S. Jayakumari, L.G. Babu, G. Suresh, Investigation on the physical, mechanical and tribological properties of areca sheath fibers for brake pad applications, Mater Res. Exp. 6 (2019) 085109.

20. C. Sivakandhan, Ganesh Babu Loganathan, Material characterization and unconventional machining on synthesized Niobium metal matrix Mater, Res. Exp. 7 (2020) 015018.

21. S. Manoharan, A.I. Shihab, A.S.A. Alemdar, L. Ganesh Babu, R. Vijay, D. Lenin Singaravelu, Influence of recycled basalt-aramid fibres integration on the mechanical and thermal properties of brake friction composites, Mater. Res. Exp. 6 (2019) 115310.

22. G Sai Krishnan et al Investigation of Caryota urens fibers on physical, chemical, mechanical and tribological properties for brake pad applications Mater. Res. Exp. 015310 2019/12/16

23. G Shanmugasundar Fabrication and analysis of mechanical properties of PVC/ Glass fiber/graphene nano composite pipes Mater. Res. Express 7 115303

24. B.K. Patle, Ganesh Babu L, Anish Pandey, D.R.K. Parhi, A. Jagadeesh,A review: On path planning strategies for navigation of mobile robot, Defence Technology, Volume 15, Issue 4, August 2019, Pages 582-606.

25. Dr.A.Senthil Kumar, Dr.Venmathi A R ,L.Ganesh Babu, Dr.G. Suresh, "Smart Agriculture Robo With Leaf Diseases Detection Using IOT", European Journal of Molecular & Clinical Medicine, Volume 07, Issue 09, PP 2462-2469.