

Field Controlled Picker Robot

Abdülkadir ÇAKIR

Isparta University of Applied Sciences, Faculty of Technology,
Department of Electrical and Electronics Engineering, Isparta, Turkey

ABSTRACT

Today, technology is developing at the same rate in line with rapidly increasing human needs. The efforts made to meet these needs make life easier with each passing day and these studies are concentrated on robotic arm studies. The robotic arms work with an external user or by performing predetermined commands. In this study, education health and so on. A field controlled picker robot is designed and applied. Realized picker robot; one robot arm and 3 wheels. The robot arm, DC motor, distance sensor, line tracking sensor, L298N motor driver, arduino uno, 3.7V 3A lithium battery are mounted under and above this vehicle chassis. Line sensors allow the robot to start its movement within a certain area without allowing it to move out of the area. When the distance sensors in the front part of the vehicle detects an object within a certain distance, it stops the movement of the motors and starts the robot arm movement which is formed with the help of 4 servos. The robot arm bends to the front at an angle of 150 degrees from the initial state and squeezes the garbage in front of it with the handle. It then turns 180 degrees behind and leaves the object in its chamber. With this picker robot to be realized with this study, garbage collection, cleaning and so on. works can be realized unmanned.

KEYWORDS: robotic arm, motor drive, ribbon tracking

1. INTRODUCTION

From past to present, people have always needed additional auxiliary systems. With the rapid increase in the flow of information, it has led people to search for different markets and people have entered competition in order to manufacture quality products cheaply. In order to achieve this, automation systems are needed. Because for a quality product, standardized automation systems that minimize errors are required as well as experienced and well-trained employees. People felt the need to use auxiliary machines in places where their strength was not enough due to their physical characteristics. These machines, which were previously operated with the need for human assistance, have been made to operate spontaneously without the need for human power with the advancement of technology (Aydoğan, 2016).

Robots are now used in many areas today. The word robot is used in the Czech language to mean heavy work, and the word robot was first used in the movie Rossum's Universal Robots in 1921. Later, with the development of robot technology and the combination of software and hardware, robots developed

completely depending on their imagination. Robots are automatic systems that perform the tasks determined according to their purpose, at the desired time and with the least error. Today, robots are used to save manpower, keep human errors to a minimum and prevent time loss. In this project, it is ensured that it is used more actively as a robot arm without being a complete robot (Bozkurt, 2014; Özfırat, 2009).

First of all, the function of the robot arm and what movements it can perform were determined. Arduino controlled robot arm; It can move and mix the desired material and execute commands predetermined by a user. The task determined in this project is; After detecting a garbage in front of the robot arm, it takes that garbage and brings it to the desired location, then records its movements and makes it do the same movement until there is no garbage around. In order for these operations to be carried out properly, the servo motor has been preferred because the motor to be selected must be able to operate precisely and have a high torque. The robot arm consists of 4 servo motors and can move in 3 axis directions with the help

How to cite this paper: Abdülkadir ÇAKIR "Field Controlled Picker Robot" Published in International Journal of Trend in Scientific Research and Development (ijtsrd), ISSN: 2456-6470, Volume-5 | Issue-6, October 2021, pp.1320-1324, URL: www.ijtsrd.com/papers/ijtsrd47588.pdf



Copyright © 2021 by author (s) and International Journal of Trend in Scientific Research and Development Journal. This is an Open Access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0) (<http://creativecommons.org/licenses/by/4.0>)



of these motors (Aydoğan, 2016; Gürgöze & Türkoğlu, 2019).

2. HISTORICAL DEVELOPMENT OF ROBOTS

The desire to give life to artificial systems lies deep in human history. In Greek mythology, the great Talus, the bronze slave crafted by the titan Prometheus and Hephaestus, who made the mold of man from the earth, were assigned to protect the island of Crete from the invaders and they undertook this task. The concept of "Robot", as formed in the minds of people today, was first introduced in 1921 by Czech playwright Karel Čapek in the science fiction story Rossum's Universal Robots (RUR). This story also derived the term robot from the Slavic word robota, meaning managerial workforce, to denote the automaton built by Rossum. The story also rebels against humanity at the end of this automaton (Kafalı, 2019; Kyriakopoulos, 2006).

In the 1940s, famous science fiction writer Isaac Asimov thought of the robot as an automation of human appearance. Apart from the tasks it is programmed to perform, the robot's behavior is guided by a "positronic" brain programmed by a human following certain ethical rules. The term robotics was coined by Isaac Asimov as a science devoted to the study of robots based on the three fundamental laws of robotics. A robot may not harm a human being or cause harm to a human by being indifferent. A robot must obey orders given by humans, provided that it does not conflict with the first law. A robot must protect its own existence, provided that it does not conflict with the first and second laws. The definition

of robot, which is widely accepted by the American Robotics Institute, is "a multifunctional and programmable manipulator designed to move materials, parts and tools, or a special tool that can perform variable programmed movements to perform different tasks". Such is the structure of an industrial robot (Erharat, 2020; Kyriakopoulos, 2006).

3. AMBIENT HUMIDITY STABILIZER WITH NEBULIZER AND DEHUMIDIFIER

With the field-controlled picker robot, a design with arduino software is being made that will collect the wastes in the environment in factories where the working environment is difficult, collect the apples that fall on the ground apart from the apples collected in the apple fields, and enable the robot arm to move in order to collect the garbage thrown on the ground in schools. At the same time, the robot arm was designed with a 3D printer and the objects in the environment were collected. With this study, it is aimed to contribute to the domestic studies of Turkey, which is in a weak situation in terms of cleanliness and sensitivity, in the field of robotics. Extra features have been added to the robot arm, which has been made more functional. The block diagram of the project is shown in Figure 1.

The robot arm will be printed with a 3D printer. Therefore, its structure is plastic. It resembles a human arm in terms of shape and size. Servos in the robot arm perform the task of the elbow and wrist in the human arm. Our robot arm consists of 2 servo motors. These servo motors provide the necessary inclination for the robot arm to pick up the object.

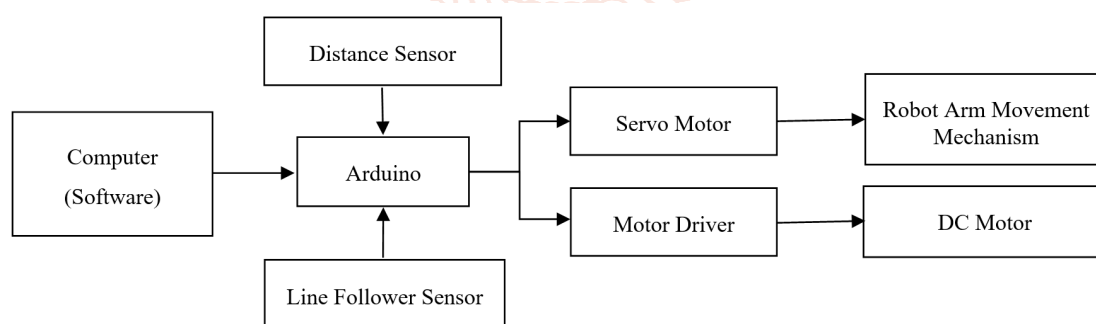


Figure 1. Field Controlled Picker Robot Block Diagram

The flow chart of the Field Controlled Picker Robot control system is shown superficially in Figure 2.

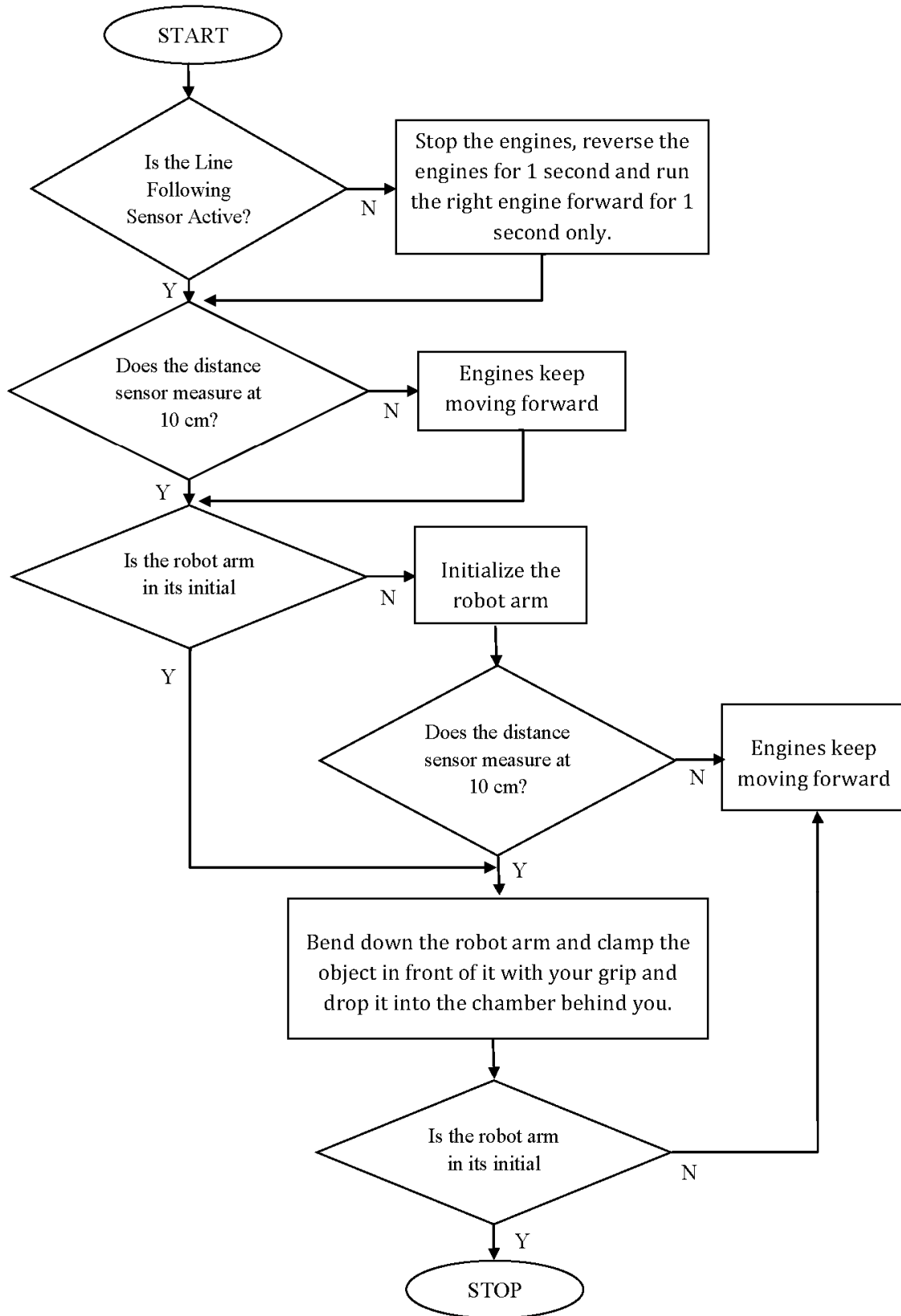


Figure 2 Flow Chart of Field Controlled Picker Robot

3.1. Robot Arm Design

The design part is divided into two, namely the design of the mechanical part and the assembly of the mechanical part. In the design of the mechanical part, the millimetric drawings of the parts to be used in the construction of the robot arm were made through the utility program. In the assembly of the mechanical

part, the naming of the servo motors used in the robot arm and their tasks during the operation of the robot are explained.

First, a historical research on robot arms was made and the basic information necessary for the establishment of the system was obtained. The robot arm used in the project is articulated type and can

move in 5 axis directions (right left, up and down), and it can hold and oscillate thanks to the handle on it. The microcontroller arduino uno R3 was chosen to provide the most suitable control of the robot arm. The reason why this microcontroller is preferred is that it is open source, easier to use than other microcontrollers, and it is more accessible to get help for solving an error that may occur because the number of users is higher.

After these studies were done, detailed information about the servo motors to be used was obtained. Servo motor was preferred because the robot should be able to perform the operations to be done in the project properly, the motor to be selected should work sensitively and it should be high torque. The robot arm consists of 4 servo motors. Due to the large number of servo motors, they are numbered from bottom to top in order to explain their duties.

3.2. Mechanical Part Design

The materials seen in Figure 3 with a 3D printer were drawn in SolidWork and their design was completed and made ready for assembly.



Figure 3. Robot Arm Material Design

3.3. Mechanical part assembly

During the assembly of the robot arm, first of all, 4 servo motors were mounted. The assembly of servo motors is shown in Figure 4.

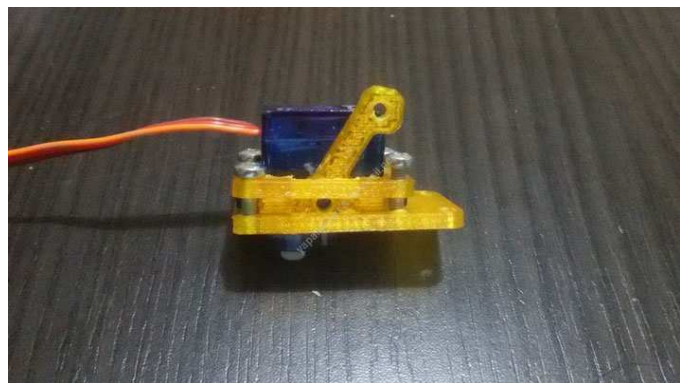


Figure 4. Servo Motors Assembly

After the assembly of the servo motors, the materials extracted from the 3D printer were combined and the robot arm as shown in Figure 5 was assembled.

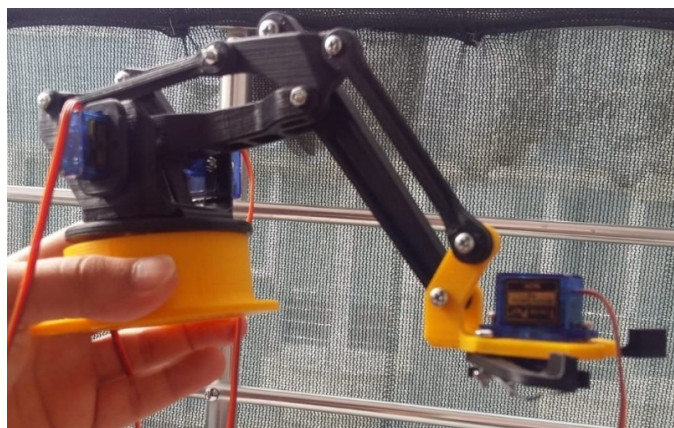


Figure 5. Robot Arm Assembly

3.4. Robot Arm Control

A junction box has been made in order to distribute the 12V voltage from the supply source to the servo motors. While doing this, servo motor inputs, arduino pin inputs and communication circuit elements are used. The mechanical part of the robot arm is designed by combining the pre-selected parts appropriately. In order to be able to move the robot arm in accordance with its purpose, the software was implemented with the appropriate arduino microcontroller, and then, experiments were made with servo motors and information about the system operation was obtained. In order for the robot arm to be moved in accordance with its purpose, the software has been implemented with the appropriate arduino microcontroller selected. Servo motor control of the entered commands is given in Table 1.

Table 1. Control of servo motors

Input Command	Servo motor for motion	Robot movement
1	A servo motor	The handle hurts
2	A servo motor	Handle closes
3	B servo motor	Turns right
4	B servo motor	Turns left
5	C ve D servo motor	Moves down
6	C ve D servo motor	Moves up

3.5. Picker Robot Motors and Drivers

In this study, the DC motor driver connection with the L298N IC of the unmanned vehicle whose software was written with Arduino is shown in Figure 6.

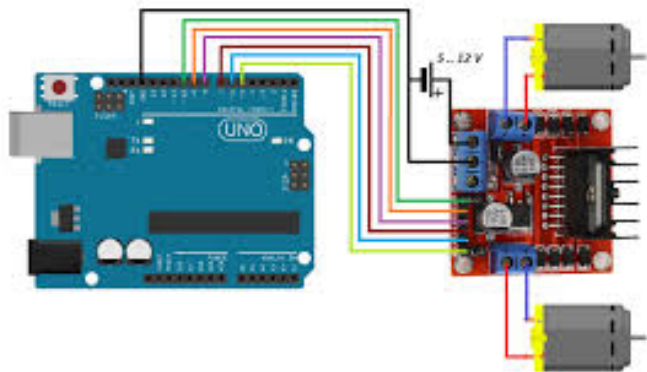


Figure 6. L298N Motor driver Arduino Connection

The connection of the servo motors that provide the movement of the robot arm with the arduino is shown in Figure 7.

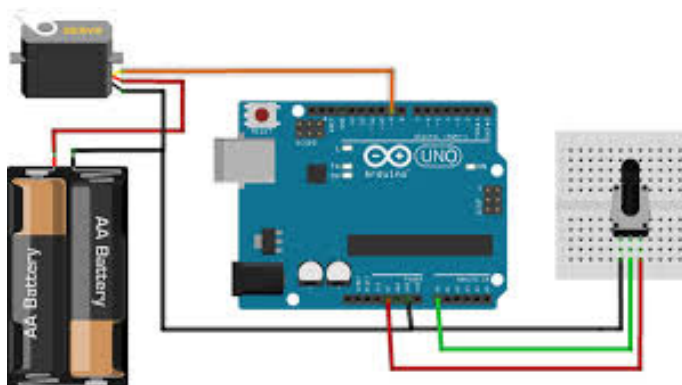


Figure 7. Servo Motor Arduino Connection

The final design of the Arduino-based robot is shown in Figure 8 after all software and hardware assembly of the vehicle is completed.

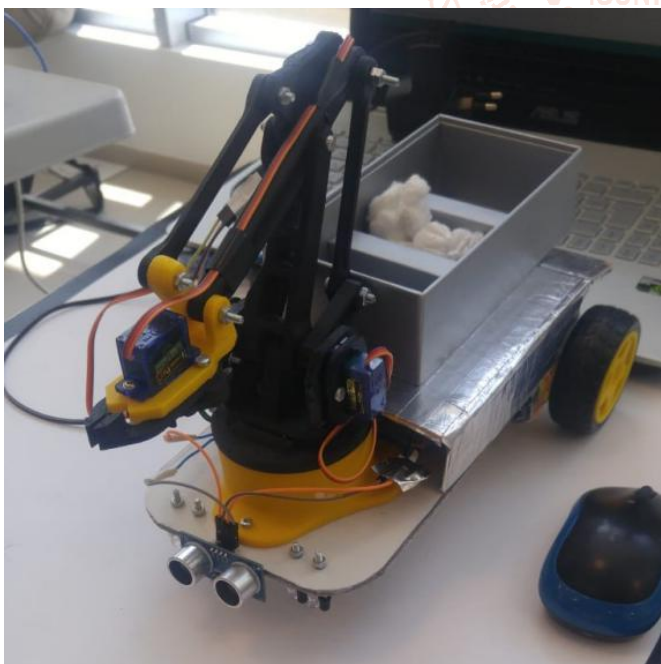


Figure 8. Field Controlled Picker Robot

4. CONCLUSIONS

Robot arms can be developed in many areas. Thanks to the robot arms, the construction of many works has been facilitated and the level of error that may arise

has been minimized. E.g; The cleaning robots used in some factories or fields are the improved version of the robot arm realized in the project. In addition, when the mobility of the robot arm is increased, a camera is placed on the finger part and its sensitivity is increased, it can have a wide range of uses from the medical sector to automation systems. With this study, it is aimed to be a robot arm and robot designed at a simple level for institutions and organizations that have not improved in cleaning order. The area-controlled picker robot picks up the object after detecting the object in front of it with the robot arm programmed with the arduino, without leaving the determined area. Realized picker robot; It will consist of a robot arm and moving parts. This moving part will ensure the movement of the robot in a certain area with the help of sensors, and the robot arm will collect the objects in the area into the chamber on the robot. The robot stays in the area determined by the black band and continues its movement in a straight way until there is no garbage in the area.

5. REFERENCES

- [1] Aydođan, B. (2016). *Arduino İle Robot Kol Kontrolü*. (MS thesis). Karabuk University Faculty of Engineering Mechatronics Engineering, Karabuk in Turkey.
- [2] Bozkurt, A. (2014). 2025'te robotlar, insanlarla birlikte yaşayıp onlara yardım edecek, peki Türkiye'de? , 86-93.
- [3] Erharat, S. (2020). *Dünyada ve ülkemizde bilimkurgu türünün doğuşu ve gelişimi/An emergence and development of science fiction as a genre*. Ankara University Institute of Social Sciences Department of Philosophy History of Science, Ankara in Turkey.
- [4] Gürgöze, G., & Türkođlu, İ. (2019). Kullanım Alanlarına Göre Robot Sistemlerinin Sınıflandırılması. *Fırat Üniversitesi Mühendislik Bilimleri Dergisi*, 31(1), 53-66.
- [5] Kafalı, H. (2019). Artificial Intelligence, Society and the Future of Religion. *Ondokuz Mayıs University Review of the Faculty of Divinity*(46), 145-172.
- [6] Kyriakopoulos, K. J., and Savvas G. Loizou. (2006). Robotics: Fundamentals and Prospects. In M. Axel Munack. St. Joseph (Ed.), *CIGR-The International Commission of Agricultural Engineering* (pp. 93-107). USA: Copyright American Society of Agricultural Engineers.
- [7] Özfirat, M. K. (2009). Investigation of Robotic Systems and using in Mining. *Journal of TÜBAV Science*, 2(4), 412-425.