AUTOMATION OF ITEMS ARRANGEMENT USING ROBOTIC ARM

Atmoko Nugroho[1], and Gigih Budi Prastyo[2]

[1] Information Technology Program, Faculty of Information Technology and Communication, Semarang University, Indonesia
[2] Information Technology Program, Faculty of Information Technology and Communication, Semarang University, Indonesia

Abstract—In the industrial world, the process of arrangement or moving item at the company still use human labor. This process requires a lot of manpower and time and labor costs. In today's, developing robotic technology is expected to be useful for all fields, one of them is in the industrial world in order to ease human work in doing their work in the industrial world. Robotic ARM can be driven automatically in a limited space and controlled by Atmega328 microcontroller (Arduino UNO R3 DIP). Potentiometer is used as a manual control of the mini servo motor and two buttons as a function of recording and moving automatically. This robot arm uses 4 mini servo motors as arm drive. The purpose of making this tool is expected to assist in solving a small part of the problems that exist in the world of industry.

Index Terms— Robotic ARM, Arduino Uno, Microcontroller, Servo

1. Introduction

The development in the industrial world is currently growing and has become a part of the world as a whole. The development of this industrial world has provided a lot of convenience and advantages to the company in the process. In the industrial world, items that will be moved not only one size, but a lot like in the process of moving or arrangement items with a small, medium and large size. If the moving or arrangement process is still using human power (manual) it will consume a lot of time and energy.

This robot is designed to emulate the motion of a robotic arm shaped like a tweezer that is driven by 4 mini servo motors. The designed robot has 3 movements, namely to move the tweezer closed and open, rotate the arm and move the tweezer up and down. To move the robot, regulated by Arduino Uno as a microcontroller, potentiometer as a tool to drive 4 mini servo motors and 2 buttons as an automation of 4 mini servo motors.

Based on the description, it is necessary to have a system that can move or arrangement an item that is in one place to another repeatedly. So that the process of moving or arranging the items can be done effectively and efficiently without the need to waste a lot of time and energy. To save the process, the idea came up to make " AUTOMATION OF ITEMS ARRANGEMENT USING ROBOTIC ARM ".

2. Theoretical Basis

2.1 Arduino

Arduino is the family name of a microcontroller board which was originally made by a smart projects company. One of the creators is Massimo Banzi. This board is hardware that is "open source" so that it can be made by anyone [4].

2.2 Microcontroller

Microcontroller is a functional computer system on a chip. Inside the microcontroller there is a core processor, memory (a small amount of RAM, program memory, or both), and input-output equipment. Like most computers, a microcontroller is a tool that works on the instructions given to it [7].

2.3 Software Arduino IDE

Arduino IDE (Integrated Development Environment) is a software for writing programs, compiling into binary code and uploading them into microcontroller memory [7].
Arduino IDE Software is software written using Java.

2.4 System

The system is a group of elements that are integrated with the same goal to achieve goals. The system as a collection or group of any component parts, both physically interconnected with each other and work together harmoniously to achieve a goal, it can also be said to guide the organization in achieving its stated goals [2].

The system is defined as a collection of interrelated and interconnected procedures for carrying out a task together [3].

The system is basically a group of elements that are closely related to one another, which function together to achieve certain goals [6].

A system has certain characteristics or characteristics, namely [6]:

a. Components

The system consists of several components that interact with each other, meaning that they work together to form a unity.

b. Boundary

The boundary of the system is an area that limits between one system and another system or system with its external environment.

c. Environtment

Everything outside the system, the environment provides assumptions, constraints and input to a system.

d. Interface

A place where certain components or systems and environments interact.

e. Input

Resources (data, raw materials, equipment, energy) of the environment consumed and manipulated by a system.

f. Output

Resources (information, reports, documentation, computer screen display, finished goods) provided for the system environment by activities in a system.

g. Process

A system has a process step that will convert the input into an output.

h. System Target

The goal of the system has a definite purpose and the nature of its operation can be predicted precisely.

2.5 *Micro Servo*

Micro servo is a rotary device or actuator (motor) designed with a closed loop feedback control system, so that it can be set-up or set to determine and ensure the angle position of the motor output shaft. A servo motor is a device consisting of a DC motor, a concatenation of gears, a control circuit and a potentiometer. A concatenation of gears attached to the DC motor shaft will slow down the shaft rotation and increase the servo motor torque.

2.6 *Potentiometer*

Potentiometer (POT) is one type of resistor whose resistance value can be adjusted according to the needs of the electronic circuit or the needs of the user. Potentiometers are families of resistors that fall into the category of variable resistors. Structurally, the potentiometer consists of 3 terminal legs with a shaft or lever that functions as a regulator.

2.7 *Push Button*

Push Button is a press switch that functions as a breaker or connection of electrical current from the current source to the electric load. A push button system consists of a switch press start, stop reset and a push switch for emergency

3. Research Methodology

Research methodology is a procedure used in collecting, processing and analyzing data in scientific.

1) Data Collection

Data is a material that is very important for the process that produces information. Therefore, data collection needs to be done carefully, so that the data obtained can be useful and quality. The data collection method that I use is library studies, is a method of data collection carried out by searching, reading and collecting documents such as books, articles and literature as references, which relate to the research topics to be conducted.

2) System Development Method

In designing the system, steps are needed to develop the system in order to get a system that is reliable and as expected. The method in writing this research is to use the Prototype method.
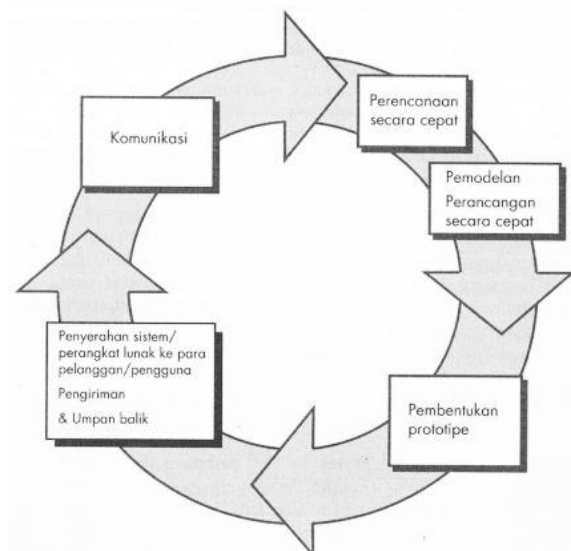

Figure 1. Prototype Model [5]

Part of the prototype method in Figure 1 above is as follows

a. Communication

The developer communicates with the user to find out what the user feels when using the tool as well as searching and studying journals or literature related to Robotic ARM.

b. Planning Quickly

After communicating, then determine the hardware that will be used for making the prototype.

c. Precise Design Modeling

The next step is to design flowcharts and design block models.

d. Prototype Formation

After designing the tool, start creating prototypes from the specified hardware.

e. System Submission to Users and Feedback

After being tested from the developer side, it has been deemed successful, the tool is then submitted to the user for testing. When tested by the user, the user must provide

advice about the tools that have been made so that the Robotic ARM tool can function even better.

3) Blackbox Testing

Blackbox testing, also called behavior testing, focuses on the functional requirements of software. Blackbox testing techniques make it possible to create several sets of input conditions that will fully perform all functional requirements for the program [5].

4) Alpha Testing

Alpha testing is carried out on the developer side by a group of representatives from end users. This software is used in natural conditions where the developer looks at the user's eyes and records errors and usage problems [5].

4.   Product And Discussion

4.1 Block Diagram

Figure 2 below explains the block diagram of this research. There are 2 inputs namely push button and potentiometer which will regulate the servo motor through Arduino
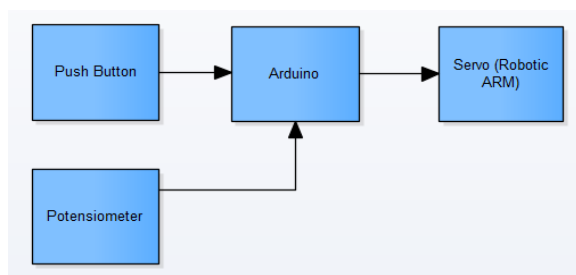
Figure 2. Block Diagram Model

4.2 Flowchart Design System

Flowchart is a chart that has a flow that describes the steps to solve a problem. Flowchart is a way of presenting an algorithm [1]. Figure 3 illustrates the program flow diagram created. Starting from initialization, input the next movement, save it, then run according to the recording movement.

4.3 Schematic of The Whole Circuit

In this schematic circuit explains the whole prototype that the researcher designed. In Figure 4 there is a breadboard, arduino, push button, potentiometer and servo that are connected to each other. Arduino uno as the controller of the entire concatenation in charge of receiving, processing data. While the potentiometer itself is used as a control device that forwards it to the servo.
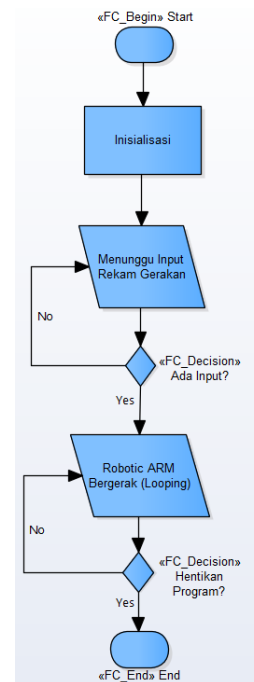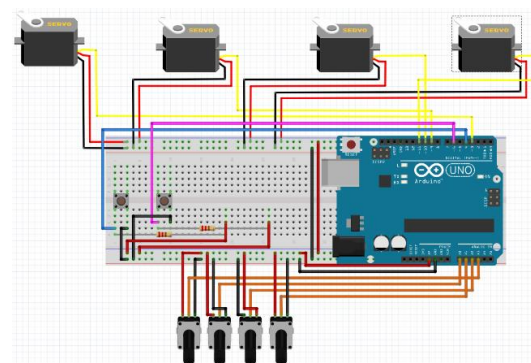
Figure 3. Flowchart

Figure 4. Schematic Robotic Arm

5.   Implementation and Product

The circuit in Figure 5 below has their respective functions, from the servo circuit, push button and potentiometer which function as servo motion controller (Robotic Arm)
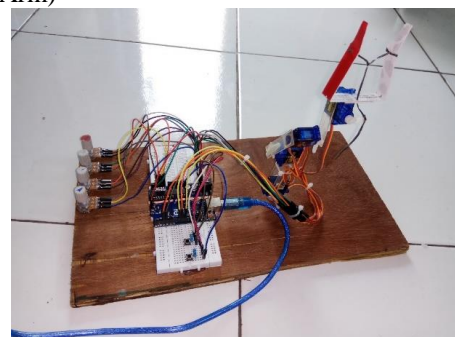
Figure 5. Product

6. Conclusion

The conclusions obtained from the results of the discussion and testing on the research of Automation of Items Arrangement Using Robotic ARM are:

a. With the Robotic ARM can move or arrange one item without having to drain a lot of energy.
b. The system that has been built can run as expected, this is evidenced by system testing and seen from the responsiveness to users who have the potential to use this system.
c. This Robotic ARM is in motion as desired by rotating the potentiometer that has been concatenation in the system.
d. This system is equipped with record and play feature, so users can record the movements of the Robotic ARM, and play to move the Robotic ARM repeatedly with the previous recorded movements.
e. Need to add an LCD to provide text notifications to users.
f. In order to make the Robotic ARM movement more flexible it should use more than 4 mini servo.
g. Press the reset button on Arduino if the Robotic ARM motion stops to restart the system.
h. Robotic ARM motion tool to lift heavier weights, can use servo specifications above the mini servo SG90.
i. Material in building Robotic ARM to make it more study can using acrylic or iron.

REFERENCES

[1] Bin Ladjamudin, Al-Bahra. (2013). Analisis dan Desain Sistem Informasi. Yogyakarta: Graha Ilmu.
[2] Darmawan, Deni dan Kunkun Nur Fauzi. (2013). Sistem Informasi Manajemen. Bandung: PT Remaja Rosdakarya.
[3] Eka Pratama, I Putu Agus. (2014). Sistem Informasi dan Implementasinya. Bandung: Informatika.
[4] Kadir, Abdul. (2013). Panduan Praktis Mempelajari Aplikasi Mikrokontroler dan Pemrogramannya Menggunakan Arduino. Yogyakarta: Andi.
[5] Pressman, Roger S, (2012). Rekayasa Perangkat Lunak. Yogyakarta: Andi.
[6] Sutabri, Tata. (2012). Analisis Sistem Informasi. Yogyakarta: Andi.
[7] Syahwil, Muhammad. (2013). Panduan Mudah Simulasi dan Praktik Microkontroler Arduino. Yogyakarta: Andi.