Garbage Collecting Ship Robot Using Arduino Uno Microcontroller Based On Android Smartphone

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Abstract

Trash along the banks of the Siak tributary was too far away for hand picking, therefore an excavator was used instead. Garbage-collecting robot system built on board ship using ardino uno microcontroller, PlayStation 2 joystick controller, and Android smartphone to be utilised in the middle of the Siak tributary. An Android smartphone, a PlayStation 2 wireless receiver, an Arduino Uno microcontroller, a PlayStation 2 joystick, a motor relay driver, a DC motor, a servo motor, and a camera are all part of the gadget. The PS2 joystick talks to the PS2 wireless receiver, which sends commands to the Arduino Uno microcontroller; the Arduino Uno microcontroller, in turn, regulates the voltage of the electric current flowing through the motor relay driver, which in turn drives the DC motor; the Servo motors push trash along the riverbed; and the smartphones display the camera's output. The prototype method is being used in this instance. The results showed that the robot ship prototype, which is limited to picking up objects no heavier than 200 grammes (such as bottle caps, gallon caps, and drink glasses), could communicate with an Arduino Uno from a distance of 25 metres when no obstructions were in the way, and from a distance of 15 metres when obstructions were pre

Keywords – Arduino Uno Microcontroller, Prototype, ps 2 Joystick, Ps 2, Android Smartphone, Garbage Collection.

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INTRODUCTION

With each passing year, the land, air, and rivers that flow through urban areas become more polluted due to the increased amounts of industrial waste and domestic waste produced by the growing population. Because of the rise in population, garbage production has increased year after year. Garbage is a common type of problem that people all over the world have to deal with. Trash can be classified as either organic (wet) or inorganic (dry).

Organic and inorganic trash are the two main types of river trash. The opposite of wet waste, or inorganic waste, is organic waste, which easily breaks down in the environment. Constant dumping of trash into the river leads to flooding during times of heavy precipitation and water pollution in the river, both of which are bad for the people who live near the Siak River tributary because some of them use the water for drinking and other purposes. Table 1 shows waste statistics for the years 2017 through 2019.

Year	Garbage in the River (Tons / Day)	Amount of Garbage (Tonnes / Month)
2017	15.180	182.160
2018	17.608	211.296
2019	21.129	253.548

Table 1. Waste data from 2017 - 2019

Pekanbaru City's Environmental and Cleanliness Service reports that the amount of trash in the city's waterways has steadily grown over the past three years, with the majority of this debris consisting of plastic water bottles, bottle tops, and empty shampoo containers that float down the river. Twice a week, cleaning staff members use an excavator to remove trash from the river.

Cleaning crews typically utilise an excavator to remove trash from the river that has accumulated in the water. The Siak River is

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under the direct control of the cleaning service, and this machine works by collecting trash at the river's edge. The excavator machine's reach is just 3.5 metres from the edge of the Siak tributary, making it impossible to pick up debris floating in the centre of the Siak river. Glass bottles and plastic bags predominate among the trash that has washed up in the middle of the Siak. The garbage in the middle of the Siak tributary cannot be picked up by the excavator, so the janitor pushes the trash to the excavator so it can be picked up. It is anticipated that this robot ship would be able to assist garbage collectors in the middle of a river 10 metres wide by collecting items such as drink containers, bottle tops, and plastic debris. New game controllers, such as analogue sticks and triggers, powered by Google's Android OS, the Arduino Uno microcontroller, and Linux, can remedy the situation.

Scientific data is gathered by collecting rubbish in a river. Joystick from a PlayStation 2 video game console is used to control a garbage-collecting robot boat on the Siak River; the boat is piloted using a smartphone running the Android operating system, on which the results from a few tiny cameras and an Arduino can be viewed. The goal of this project is to use an Arduino Uno and a Wireless Playstation 2 Adapter to create an input/output system. When contrasting a Playstation 2 joystick with an Arduino Uno. In light of recent developments in scientific and technological infrastructure, there is a need for a system that can help clean up rivers by collecting trash next to rivers and assisting with management to boost the efficiency of cleaning crews.

METHODOLOGY

The researcher develops a prototype during this phase. because this is the approach taken by programmers working in the software industry[13]. At its core, this method entails developing a system from the ground up.

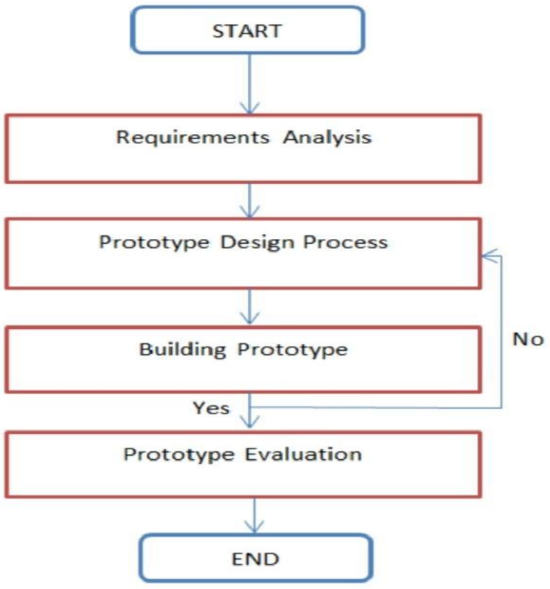

Fig.1. Prototype Model Stages

The steps involved in creating a model prototype are as follows:

- Collection of Needs

At the Requirements Collection phase, the customer and developer work together to design the software and identify needs and systems, all while consulting with the Pekanbaru City Environmental and Sanitation Office.

- Prototype Design Process

Before beginning the actual tool-making process, the authors at this stage plan and design the design.

- Building Prototype

At this point, the author creates a prototype while also developing a provisional design with an emphasis on developing instruments.

- Prototype Evaluation

The Pekanbaru City Environment and Sanitation Service cleaning officers will be able to see the results of the software design in the Prototyping Evaluation Phase, which will determine whether or not the prototype built meets the janitor's wishes and needs. If there is a discrepancy, we will go back to the drawing board and try again.

RESULTS AND DISCUSSION

Process Analysis

The purpose of a process analysis is to examine every step, from the conception of the Playstation 2 system and the development of the joystick controllers, to the point at which the controllers can be used to pilot a robotic garbage boat in a river. The steps involved in building a trash-collecting ship robot for the

river using an Arduino Uno microcontroller and a PS 2 joystick controller based on an Android smartphone are as follows:

1. The paralon-covered acrylic pipes make up the vessel's construction.
2. The dimensions of the vessel are 21 by 2.97 millimetres.
3. If you want to use a PlayStation 2 joystick with an Arduino Uno R3, you'll need to connect the wireless receiver device for that console to the Arduino.
4. By connecting the Arduino Uno R3 to the motor relay driver, which controls the DC motor's voltage, you may move the ship robot.
5. Attaching an Arduino Uno R3 to a servo motor that will serve to hoist trash into the ship robot.
6. Use a PlayStation 2 joystick to direct the robotic garbage boat's left, right, forward, and reverse motions in the river.
7. Smartphone used as a monitor for a wirelessly linked camera's output.Performing an

Analysis of the System's Configuration

This article will detail the steps required to set up a river-bound garbage-collecting robot ship using an Arduino Uno microcontroller and an Android smartphone serving as a PS 2 joystick controller. The image below is a set of parts for a Robotic Waste Collection Ship using an Arduino Uno Microcontroller and an Android Smartphone as a Joystick Controller for a Playstation 2.

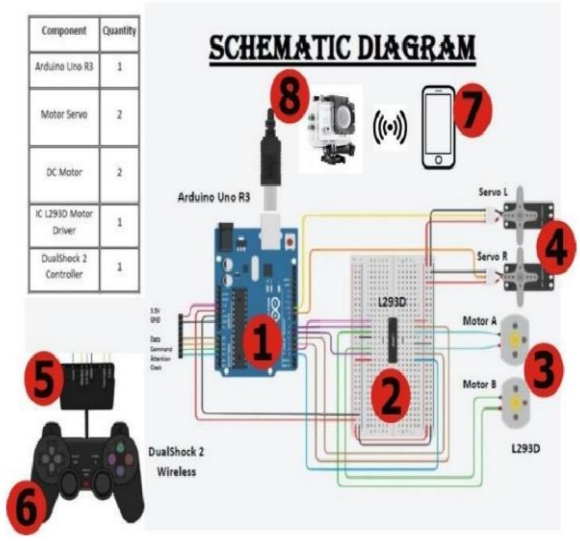

Fig.2. Overall Hardware Configuration Series

From Figure 2, it can be explained as follows:

1. Arduino Uno R3

A microcontroller is the central part of an application's control system, where all user input is interpreted and executed. It is possible to use either a USB cable or an external power supply to power the Arduino Uno.

2. Ic L293d Motor Driver

The Ic L293d Motor Driver is used to modify the rotational direction and rotational speed of a DC motor or stepper motor. 50-volt DC and stepper motor output voltage capability.

3. Motor Dc

When it comes to electric motors, a DC motor is the type that requires a direct current (DC) voltage source to function. DC motors, also known as direct current motors, only allow for direct current and a single direction of flow. Direct current (DC) motors find niche use where a high starting torque or constant acceleration over a broad speed range is required.

4. Servo Motor

A servo motor, also known as a rotary actuator (motor), is a device or rotary actuator (motor) built with closed-loop feedback (servo) control systems to determine and guarantee the angular position of the motor output shaft.

5. Wireless Ps2 Receiver

Functions as a receptor for signals transmitted from the PlayStation 2 joystick

6. Joystick Ps2

Serving as the ship's river trash collector robot's operator.

7. Smartphone

Used as a monitor to show footage captured by a wifi-connected camera.

8. Camera

Utilized as a means by which to perceive the robot garbage plaguing the spacecraft's environs. Robotic garbage-collecting boats are now in use.

Fig. 3. Implementation of a garbage collection vessel robot

System Testing

The Arduino Uno microcontroller and a PS 2 joystick controller based on an Android smartphone can be put through their paces in a series of tests replicating real-world conditions aboard a trash collection ship robot.

- A trash-collecting boat robot on the river should be activated first.
- After that, the Arduino Uno microcontroller-based garbage-collecting ship robot system's supporting hardware, including the Arduino Uno, Motor Relay Driver, DC Motor, Servo Motor, and PS 2 Receiver, will power up and begin collecting rubbish from the floor.

Fig.4. System Devices Turns on

- To use the PS2 joystick as a robot controller for the trash boat, turn it on.
- Join the PS2 controller to the PS2 wireless receiver, and the Arduino Uno will execute commands from the controller.
- The camera on an Android smartphone can be used to observe trash in the river when the user turns on the medium's lighting and motion detection features.
- Then fire up the Android phone's camera app, switch on its Wi-Fi, and attach its display to the camera so you can check out the garbage.

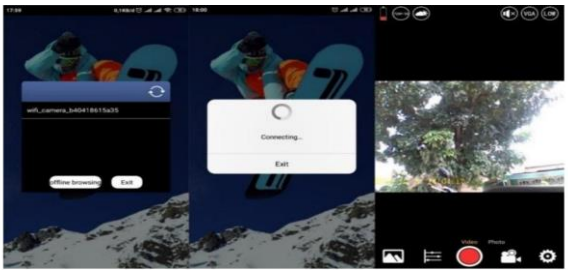

Fig. 5. Turn on Wifi Smartphone and Open the Camera Application

- After ensuring that the PS 2 controller is properly wired, we proceed to try out the buttons.

Figure. 6. Button Test

PS2 Wireless Receiver Connection Strength Test at a Distance The range of the ps2 Wireless joystick transmitter was evaluated so that it could be used to programme the Ps2 Wireless Receiver on the Arduino Uno.

Distance	There is a Barrier	Tanpa Without Barriers
1 Meter	Detected	Detected
2 Meter	Detected	Detected
3 Meter	Detected	Detected
4 Meter	Detected	Detected
5 Meter	Detected	Detected
7 Meter	Detected	Detected
10 Meter	Detected	Detected
15 Meter	Not detected	Not detected

Table 2. Testing the connectivity of the Wireless Ps2 Receiver

The above test of connectivity revealed that the Ps2 Wireless Receiver had a range of up to 10 meters.

Testing Tools

Trial Number	Type of Testing	Which is expected	Result
1	Move forward	Tools can move forward	Accepted
2	Moving backward	The tool can move backward	Accepted
3	Move Turn Left	The tool can turn left	Accepted
4	Move Turn Right	The tool can turn right	Accepted

Table 3. Testing Motor Dc

Trial Number	Type of Testing	Which is expected	Result
1	Litter bottle caps	The tool can lift plastic waste	Accepted
2	Garbage Cover Gallons	The tool can lift plastic waste	Accepted
3	Glass Drink Trash	The tool can lift plastic waste	Accepted

Table 4. Servo Motor Testing

Trial Number	Type of Testing	Which is expected	Result
1	Camera Connection	Camera Connected to a smartphone	Accepted
2	Camera	The camera can see the trash around the ship robot	Accepted

Table 5. Camera Testing

CONCLUSIONS

In light of what has been learned through investigation, planning, and actual execution. The following are some of the inferences that can be made: One can control the ship's forward motion, reverse motion, left and right turns, and trash collection with a PlayStation 2 (PS2) joystick and a PlayStation 2 (PS2) wireless receiver. Only 200 grammes of trash, like beverage container caps and gallon jug tops, can be picked up by the ship robot prototype. In order to reduce waste buildup and water pollution in the river, this prototype ship robot is controlled by a PlayStation 2 joystick with a connection distance between the joystick and wireless receiver of only 10 meters. Using preexisting technology, such as a wireless PS2 joystick as a control for a robotic ship/trash boat on a river, an Arduino Uno microcontroller as hardware to process the system's input/output, and a motor controller, we were able to successfully complete this project.

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