|  |  |
| --- | --- |
| A diagram of a robot  Description automatically generated with medium confidence  Robot Arm project | Abstract  This project describes the project plan to build a single robotic arm. First, the project plan that contains the main goals and the project overview. Second, the project outlining is provided. To specify every task in the project. Third, a project timeline that declares the duration and date for each task. Fourth, the project scope is to provide more detail for every task. Finally, the production line. That displays the process of manufacturing. Haneen Mohammed Alhaji Ahmed  Smart Methods |

Table of Contents

[Project plan 2](#_Toc76183132)

[Project outline 4](#_Toc76183133)

[Project timeline 5](#_Toc76183134)

[Project Scope 7](#_Toc76183135)

[The production lines 9](#_Toc76183136)

**Table of Figures**

[***Figure 1 project overview 4***](#_Toc76183137)

[***Figure 2. project's sub tasks information 5***](#_Toc76183138)

[***Figure 3 project's timeline in months 6***](#_Toc76183139)

[***Figure 4 project's timeline in days 7***](#_Toc76183140)

[***Figure 5 production process of a single robot arm 11***](#_Toc76183141)

**Table of Tables**

[***Table 1 table displaying the project scope for each task in detail. 8***](#_Toc76183152)

# Project plan

Due to the increasing demand for the use of robots or automated parts. Which uses artificial intelligence in all industries and fields. In this project, we seek to build a robotic arm. Contains knuckles, wrists, and ultimate potency. To participate in the balloon wrestling competition. Wrestling is based on two competitors controlling a movable base containing the balloon and the robotic arm. The control will be via a remote control interface. Thus, the design of the arm and end of the arm will be suitable to perform this task efficiently. It will be detailed later in this project paper. The initial project value will be 480 per robotic arm. To increase the utility of this robotic arm, the effective end can be easily separated to be replaced by another effective end. The need for a robotic arm is now more practical and has multiple benefits for owners.

As for the possible prospects for this project. is to get the robot arm working properly. All necessary measurements, processes, designs, and simulations will be provided. To provide suitable and proportional parts for the project. From the base to the robotic arm. It is worth noting that the time required to fully deliver this project should not exceed three months. And the general division is like this. The first month to produce the first electronic arm. The second month is for testing and modification. And the third month to produce and deliver the agreed number of robotic arms. Look for figure 1 for the project visualization.

Diagram

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Figure 1 project overview

# Project outline

To outline the project and set up clear sub goals see the figure below. Where each task has a clear goal definition. In addition, the start and due dates are declared. Duration is extracted out from the start and due dates. Also, the dependencies or the predecessors guarantee that a task must be accomplished after the specified task in the predecessor field.

Table

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Figure 2. project's sub tasks information

# Project timeline

A project timeline provides a clear division of the workflow. To acknowledges the team and the stakeholders. With the help of the Wrike application. We manage to visualize the time needed in two perspectives. In days and in months.

Graphical user interface, text, application, Word

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Figure 3 project's timeline in months

Graphical user interface

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Figure 4 project's timeline in days

# Project Scope

In this section, table is used to show every task. That will be described in detail. The series of actions required to accomplish each task. The duration and substances needed. Besides specifying the responsible for execution.

Table 1 table displaying the project scope for each task in detail.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Task name | Task description | Executer | hardware | software | Duration |
| create the database | With initial knowledge of the project, we can set up an initial table represent the control options of the robot arm | IOT and developers’ department | X | XAMMP  XAMMP’s database | 1d |
| design a web interface | Creating the basic structure of the webpage. | IOT and developers’ department | X | HTML  CSS  JS | 2d |
| design UX | It is a subtask of designing the web interface. Developers design a proper, creative, and interactive design to the user. | IOT and developers’ department | X | CSS | 2d |
| connect the website with the database | The connection is a single page that contains the comment lines for establishing the connection. Then creating quires and executing them. | IOT and developers’ department | X | PHP  XAMMP’s database | 1d |
| prepare ROS packages | package must contain catkin compliant package.xml file and CMakeLists.txt which uses catkin. Also, package must have its own folder. | AI developers’ department | X | Virtual Box.  Ubuntu melodic 18.04.  ROS.  Moveit assistant. | 5d |
| test ROS packages on a simulator | This process allows us to experience ROS packages on simulator before adapting them on the real world. And reporting any errors. | AI developers’ department | X | Gazebo.  Rvis.  Joint state publisher. | 3d |
| connect the website with the ROS | To send any information entered by the user to the arm. Therefore, control the arm remotely. | AI developers’ department | X | Webui.  QGroundControl. | 4d |
| insert the program into the arm | Programming the transistor on the Arduino board. Then insert it into the physical arm. | AI developers’ department | Arduino board. | Arduino IDE. | 4d |
| test the arm | To check the connections between the database and the ROS package. And the ROS package performance on the physical arm. And reporting any errors. | AI developers’ department | physical arm. | Website page. | 5d |
| design the robot arm's physical part | Creating the parts of the arm separately. | Mechanical Department | X | Cinema 4d | 3d |
| assembly the parts | To conclude the final appearance of the complete arm. | Mechanical Department | X | Cinema 4d | 1d |
| design motor-driven circuit to the arm parts | Circuits that are responsible for controlling actuators and motors. Beside operating sensors. | Electronics and Power Department | X | Tinker cad | 3d |
| implement circuits | Evaluate the best design option to implement physically. | Electronics and Power Department | Arduino board.  Servo motors.  Sensors such as scanner. | X | 5d |
| test circuits | test circuits under different conditions. And specify the lifetime of the circuits. And reporting any errors. | Electronics and Power Department | Circuits  Implemented. | X | 3d |
| week for any modifications and submit the whole project | X | All departments | X | X | 5d |
| test the complete project | Applying system testing. To discover how all components interact together. And reporting any errors. | Internal and external test team | The physical robotic arm. | Web interface. | 22d |
| put product in production line | Start producing the agreed amount of robot arms. | Industrial engineer | Factory hardware. | Factory software. | 22d |

# The production lines

To demonstrate the process of producing a single robotic arm. That is shown briefly in the figure below. Where different stakeholders cooperate to build this project. Management, financiers, engineers, executers, and many others contribute to this project.

Timeline

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Figure 5 production process of a single robot arm