**On campus delivery robot**

by

**Muhannad Saeed Alghamdi 1846525**

**Suliman Abdullah abbas 1845862**

**Wael Rabah Aldhaheri 1846987**

**TEAM NO.:03 FALL-2021 INTAKE**

Project Advisor

**Dr. Mohammed Bilal**

**Checked and approved (ADVISOR): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

Project Co-advisor: **N/A**

Project Customer: **Dr. Mohammed Bilal**

SDP Evaluator: **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Department of Electrical and Computer Engineering**

**Faculty of Engineering**

**King Abdulaziz University**

**Jeddah – Saudi Arabia**

**NOV. 2021 G – RABI’ II 1443 H**

# EXECUTIVE SUMMARY

**On Campus Delivery Robot**

According to our information gathering, it is apparent that there is a need for an on-campus delivery solution. Which would benefit the administrators in efficiently completing their work and students by reducing time wasted going back and forth between buildings.

The university campus consists of different terrains which might make traversal more challenging for a ground robot. In addition to that, there are moving objects (people, cars) which might necessitate obstacle avoidance.

We want to create a unified and comprehensive delivery network across the KAU campus without human involvement.

Our lower-level objectives are connecting the whole university buildings into a single automated delivery network, improving productivity of employees/students by saving their time, reducing the use of fuel and manpower in the delivery process.

Our higher-level objectives are Pushing to increase development in the tech field industry in Saudi Arabia, raising awareness to decrease the carbon emission, by providing electrical alternatives., encouraging upcoming generations to R&D autonomous solutions.

For the alternative solutions, we started by brainstorming some ideas for possible solutions. We then generated some new alternatives using a morphological chart. We then ruled out some of the alternatives using a KTDA table. After the analysis, the alternatives that passed are the RoboDog, Robot Train and the Ground Robot.

We then compared the pros and cons of each alternative. The chosen solution was the Ground Robot. We picked the ground robot because it had the lowest cost, it is moderately complex, and the parts needed are easily obtained.

We then tried to further improve our baseline design. We made some adjustments, the most substantial one was replacing some of the parts (wheels, motors) with a hoverboard. In addition to that, we added ventilation holes and a hole for cable management.

***Index Terms*** *—* Navigation, obstacle avoidance, delivery robot.

# Team Activity portfolio contents

## Team Members

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Team-03** | | | | | |
| **Photograph** | **Name** | **Computer Number** | **Phone Number** | **Email** | **Specialization** |
| A person with glasses  Description automatically generated with low confidence | Muhannad Saeed Alghamdi | 1846525 | 0555664661 | Mhdghd2@gmail.com | Computer Engineering |
| A person with a beard  Description automatically generated with low confidence | Sulaiman Abdullah Abbas | 1845862 | 0504624355 | Cursoldsulaiman@gmail.com | Computer Engineering |
| A picture containing person, white, posing, black  Description automatically generated | Wael Rabah Aldhaheri | 1846987 | 0506615899 | WaAldhaheri@gmail.com | Biomedical Engineering |

## Team RUles, roles, and contributions

|  |  |  |  |
| --- | --- | --- | --- |
| **Roles and Contributions** | | | |
| **Role** | **Technical Role** | **Name** | **Responsibility** |
| Team leader/ Project manger | Navigating algorithms | Muhannad Saeed AlGhamdi | Planning and organizing the completion of tasks within the project. |
| Organizer, Gatekeeper | Obstacle avoidance algorithms | Sulaiman Abdullah Abbas | Organizes team meetings time and place and the meeting outcomes, ensures that all goals are achieved. |
| Idea Challenger, Recorder | Hardware & code Deployment | Wael Rabah Aldhaheri | Plays the role of the devil’s advocate, types the meeting minutes |

## Project tasks and timetable

Table

Description automatically generated

Figure 1 - Tasks’ list from MS Project

Chart

Description automatically generated with low confidence

Figure - Gantt chart (Red tasks are critical)

## Curricular resources

**Muhannad Saeed:**

|  |  |  |
| --- | --- | --- |
| **NO.** | **Course title** | **Course link** |
| **1** | **MATLAB** | https://www.youtube.com/watch?v=NSSTkkKRabI |
| **2** | **MATLAB plot** | https://www.youtube.com/watch?v=gDmpqn92s5U |
| **3** | **Simulink (\*)** | https://www.youtube.com/watch?v=vxzR3W2BcRk |
| **should be able to:**   * use the simple MATLAB commands & functions * build some (.m) file files for training * build Simulink models * include some MATLAB code in the Simulink model * construct 2D plots using MATLAB | | | |
| **4** | **Ros introduction(\*)** | https://www.youtube.com/watch?v=96XsJ7xfsS8&t=214s |
| **5** | **Ros using MATLAB** | https://www.mathworks.com/help/ros/ug/get-started-with-ros.html |
| **should be able to:**   * to distinguish the different ROS components * build simple projects include Nodes, Services, Messages etc. * train on building full, simple projects. | | | |
| **6** | **ROS using Simulink(\*)** | https://www.youtube.com/watch?v=IictXPCP5M4&list=PLzP7tGk94hQWmr9052g6-UbRijg\_zZsaD |
| **should be able to:**   * drag and drop to use the ROS components * build full, simple projects using Simulink and ROS. | | |
| **7** | **Power apps (\*)** | https://www.youtube.com/watch?v=aVsWQgoWC0I&list=PLib8Q64STW-tLkyHqf\_U4Gu7CWDz1E7kE&index=1 |
| **8** | **Power apps portals(\*)** | https://www.youtube.com/watch?v=mbn6-BPv34E |
| **should be able to:**   * build a very detailed prototype * convert that protype to a real power app project * use/test the project on r phone | | | |
| **9** | **Solidworks revision** | https://www.youtube.com/watch?v=qtgmGkEPXs8 |
| **should be able to:**   * build basic components using solidworks * build some expected components for training purposes | | | |

**Suliman Abbas :**

|  |  |  |
| --- | --- | --- |
| **NO.** | **Course title** | **Course link** |
| **1** | **Power apps (\*)** | https://www.youtube.com/watch?v=aVsWQgoWC0I&list=PLib8Q64STW-tLkyHqf\_U4Gu7CWDz1E7kE&index=1 |
| **2** | **Power apps portals(\*)** | https://www.youtube.com/watch?v=mbn6-BPv34E |
| **should be able to:**   * build a very detailed prototype * convert that protype to a real power app project * use/test the project on r phone | | |
| **3** | **Solidworks revision** | https://www.youtube.com/watch?v=qtgmGkEPXs8 |
| **should be able to:**   * build basic components using solidworks * build some expected components for training purposes | | |
| **4** | **MATLAB** | https://www.youtube.com/watch?v=NSSTkkKRabI |
| **5** | **MATLAB plot** | https://www.youtube.com/watch?v=gDmpqn92s5U |
| **6** | **Simulink (\*)** | https://www.youtube.com/watch?v=vxzR3W2BcRk |
| **should be able to:**   * use the simple MATLAB commands & functions * build some (.m) file files for training * build Simulink models * include some MATLAB code in the Simulink model * construct 2D plots using MATLAB | | |
| **7** | **Ros introduction(\*)** | https://www.youtube.com/watch?v=96XsJ7xfsS8&t=214s |
| **8** | **Ros using MATLAB** | https://www.mathworks.com/help/ros/ug/get-started-with-ros.html |
| **should be able to:**   * to distinguish the different ROS components * build simple projects include Nodes, Services, Messages etc. * train on building full, simple projects. | | |
| **9** | **ROS using Simulink(\*)** | https://www.youtube.com/watch?v=IictXPCP5M4&list=PLzP7tGk94hQWmr9052g6-UbRijg\_zZsaD |
| **should be able to:**   * drag and drop to use the ROS components * build full, simple projects using Simulink and ROS. | | |

**Wael Aldhaheri:**

|  |  |  |
| --- | --- | --- |
| **NO.** | **Course title** | **Course link** |
| **1** | **MATLAB** | https://www.youtube.com/watch?v=NSSTkkKRabI |
| **2** | **MATLAB plot** | https://www.youtube.com/watch?v=gDmpqn92s5U |
| **3** | **Simulink (\*)** | https://www.youtube.com/watch?v=vxzR3W2BcRk |
| **should be able to:**   * use the simple MATLAB commands & functions * build some (.m) file files for training * build Simulink models * include some MATLAB code in the Simulink model * construct 2D plots using MATLAB | | | |
| **4** | **Solidworks revision** | https://www.youtube.com/watch?v=qtgmGkEPXs8 |
| **should be able to:**   * build basic components using solidworks * build some expected components for training purposes | | | |
| **5** | **Ros introduction(\*)** | https://www.youtube.com/watch?v=96XsJ7xfsS8&t=214s |
| **6** | **Ros using MATLAB** | https://www.mathworks.com/help/ros/ug/get-started-with-ros.html |
| **should be able to:**   * to distinguish the different ROS components * build simple projects include Nodes, Services, Messages etc. * train on building full, simple projects. | | | |
| **7** | **ROS using Simulink(\*)** | https://www.youtube.com/watch?v=IictXPCP5M4&list=PLzP7tGk94hQWmr9052g6-UbRijg\_zZsaD |
| **should be able to:**   * drag and drop to use the ROS components * build full, simple projects using Simulink and ROS. | | | |
| **8** | **Power apps (\*)** | https://www.youtube.com/watch?v=aVsWQgoWC0I&list=PLib8Q64STW-tLkyHqf\_U4Gu7CWDz1E7kE&index=1 |
| **9** | **Power apps portals(\*)** | https://www.youtube.com/watch?v=mbn6-BPv34E |
| **should be able to:**   * build a very detailed prototype * convert that protype to a real power app project * use/test the project on r phone | | | |

## Design notes and drafts

Diagram

Description automatically generatedA picture containing rectangle

Description automatically generated

Figure 3 - Navigation handwritten notes

Figure 4 - Cart Sketch

Diagram, letter

Description automatically generated

Figure 5 - Project scope notes

## MEETING MINUTES

Minutes of equally-spaced meetings (as required in the First Day Material) showing all the necessary attributes and duly **signed by all the participants** must be included.