## **Glass Box**

Kinetic energy

Big Back wheels

Front Triple-wheels

F

Motors

Power

Ascends curbs

Power

Batteries

Information



Heat

Sound

Kinetic energy

Hind legs

Front legs

F

Motors

Power

Storage Unit

Movement

Carries Packages

Power

Batteries

Information



Package

Processing Unit

Sensors

Heat

Sound

1. Brainstorming
   1. Robot train tracks
   2. Golf cart
   3. Drone
   4. **Morphological chart**

Table 10 - Morphological chart

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Function** | **Means** | | | | |
| **1** | **2** | **3** | **4** | **5** |
| 1. Traversal of the campus | Wheels | Propellers | Continuous wheel track | Quadruped/Biped | Conveyer belt |
| 2. Carrying the package | Wagon | Carried Box | Pneumatic tubes |  |  |
| 3. Navigation | GPS | Predefined path | Pilotage [i] |  |  |
| 4. Maintain the safety of the package | Digital lock | Combination Lock | 2-step verification |  |  |
| **Feature** | **Means** | | | | |
| **1** | **2** | **3** | **4** | **5** |
| 1. Fast | Motors power | Mechanic | Lightweight |  |  |
| 2. Long battery life | Energy consumption | Capacity | Recharge time |  |  |

[i] navigating by reference to visible landmarks

* Alterative A: Quadruped robot with a wagon attached to it, navigates using pilotage, the packages are secured using a 2-step verification system (2FA)
* Alternative B: Conveyer belt where the packages are put in a plastic box and placed on it, the conveyer belt spans the campus on a predefined path, the packages are secured using a combination lock.
* Alternative C: Ground robot that uses wheels to traverse the campus, the package is loaded on the robot (carried box), it navigates using GPS, the packages are secured using a Digital lock

|  |
| --- |
| KTDA |
| Musts/Alternative | A: Quadruped Robot | B: Conveyer Belt | C: Ground Robot | D: Robot Train | E: Golf Cart | F: Drone |
| 1. The ability to move within 2 km range of the Engineering building autonomously on paved roads. 2. Ensures the safety of the packages. 3. Includes a storage unit for the shipments. 4. Tamper proof electronic components. 5. Made from durable material. 6. Operate within 5 km/h. 7. Can carry weight within (80kg). | **GO** / **NO** GO  **GO / NO** GO  **GO / NO** GO  **GO / NO** GO  **GO / NO** GO  **GO** / **NO** GO  **GO** / **NO** GO | **GO** / **NO** GO  **GO / NO** GO  **GO / NO** GO  **GO / NO** GO  **GO / NO** GO  **GO** / **NO** GO  **GO** / **NO** GO | **GO** / **NO** GO  **GO / NO** GO  **GO / NO** GO  **GO / NO** GO  **GO / NO** GO  **GO** / **NO** GO  **GO** / **NO** GO | **GO** / **NO** GO  **GO / NO** GO  **GO / NO** GO  **GO / NO** GO  **GO / NO** GO  **GO** / **NO** GO  **GO** / **NO** GO | **GO** / **NO** GO  **GO / NO** GO  **GO / NO** GO  **GO / NO** GO  **GO / NO** GO  **GO** / **NO** GO  **GO** / **NO** GO | **GO** / **NO** GO  **GO / NO** GO  **GO / NO** GO  **GO / NO** GO  **GO / NO** GO  **GO** / **NO** GO  **GO** / **NO** GO |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Wants | Weight | Rating | Score | Rating | Score | Rating | Score | Rating | Score | Rating | Score | Rating | Score |
| 1. All the parts for the project can be found in Jeddah | 7 | 10 | 70 | 10 | 70 | 10 | 70 | No go | | | | | |
| 1. The project can be done in 5 weeks | 10 | 10 | 100 | 8 | 80 | 0 | 0 |
| 1. The project combines all our fields (mechanical, electrical) | 6 | 5 | 30 | 10 | 60 | 10 | 60 |
| 1. The artifact could be water and dust resistant | 3 | 10 | 30 | 10 | 30 | 10 | 30 |
| 1. The project implements material learnt in class | 8 | 10 | 80 | 7 | 56 | 8 | 64 |
| 1. The Project could be made using eco-friendly materials | 3 | 4 | 12 | 0 | 0 | 0 | 0 |
| 1. Doesn’t require payment for transportation | 10 | 10 | 100 | 10 | 100 | 9 | 90 |
| 1. Could be made using less than 5 electric circuits | 8 | 10 | 80 | 7 | 56 | 3 | 24 |
| 1. The project can be easily fixed in case of a malfunction | 10 | 7 | 70 | 8 | 80 | 3 | 30 |
| 1. The project use pieces we can find in our homes. | 3 | 5 | 15 | 8 | 24 | 0 | 0 |
|  |  | ***Total A = 587*** | | ***Total B = 556*** | | ***Total C = 368*** | | ***Total D = NO GO*** | | ***Total E = NO GO*** | | ***Total F = NO GO*** | |

1. Intro+ musts+ wants + objectives
2. **Control System's Objective:** Discuss all components (Acutators: motors, power electric circuits, sensors, microelectric devices, controllers)
3. ~~Generate alternatives using morphological chart~~
4. ~~Compare alternatives using KTDA (Kepner Tregoe decision analysis)~~
5. Analysis of alternatives that pass the KTDA (Glass box (describe the systems), pros cons, cost analysis of components)
6. ~~Select an alternative~~
7. Further analysis of selected alternative (short paragraph)
8. Maturing chosen baseline design (buying motors, wasting time etc. -> Reusing a hoverboard and adding a cart to it)
9. Add 3D model of baseline design, specification, updated cost analysis
10. Discuss impact of components on economy, enviroment, society.

Next meeting:

Tentative date: **Fri 8:00 PM** 12/11/2021

1. Analysis of alternatives that pass the KTDA (Glass box (describe the systems), pros cons, cost analysis of components
2. Assign black tasks + deadlines