

RaLaZaBa ELECTRONICS

6th Weekly Report

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Done

- We tried to correct our mistakes about proposal report. What we did is that
- *We defined our functional requirements.
- *We defined our objectives and their metrics.
- We worked on concept generation and produced some ideas for our requirements and methodologies.
- We purchased distance measurement sensor and trackball mouse for experimental purposes.
- We talked about the topics of standard committee which are about color, height and shape of the objects.
- We made the task distribution. Nail and Selman will study SolidWorks. Ali, Anıl and Enes will work on Simulink to create a simulation environment of the design.

To Do

- We will make brain storming on the candidates of solution methods to converge our design.
- We will test the sensors. The tests will be important for standards because we need to know how our components will work under defined conditions. Moreover, the tests will help us to determine our solution methods.
- We will search some articles about self-localization and object localization which will be important for our concept generation.

Functional Requirements

The requirements that our design must perform are listed below.

Motion in 2D directions

Since the problem defined as mapping of a planar environment, our robot should move on ground plane.

Determining self-positioning

For this requirement, the device is supposed to determine its position during the operation.

Measurement of environment

The device is supposed to obtain the position information of the intended plane by taking measurements of the environment.

Data processing and transmission

In this requirement, the robot should projectile the measured data to given reference point and delivered to the user.

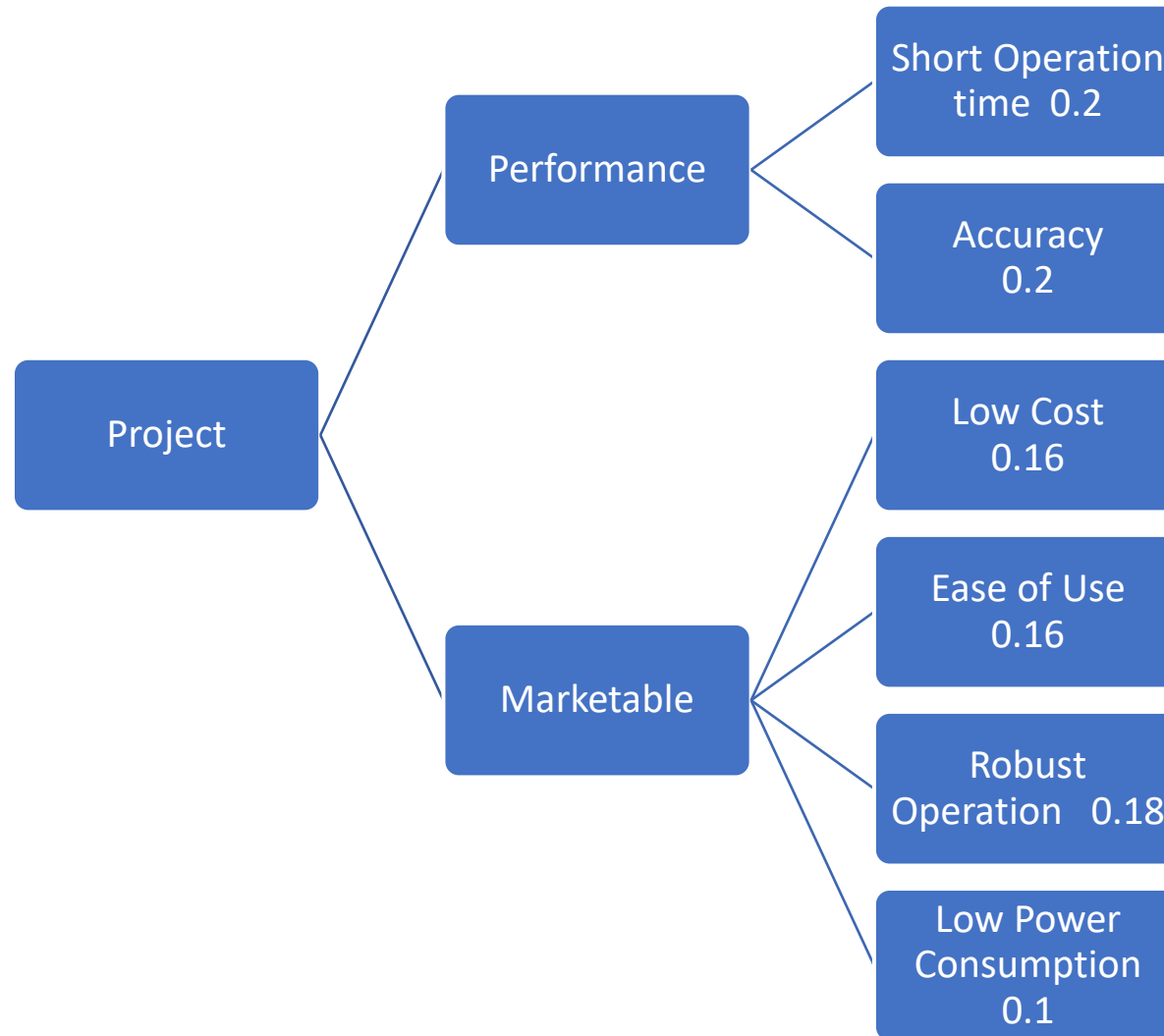
Objectives

For our project, we examined our objectives which our design must meet.

1. Accuracy
2. Cost
3. Ease of use
4. Operation time
5. Power consumption
6. Robustness

From the objectives, we provided an objective tree which has also weights of these objectives.

Weighted Objective Tree



The metrics that we defined are listed below. According to these metrics we will select the most appropriate design for our project.

	Short Operation Time	Accuracy	Low Cost	Ease of use	Robust operation with changing environment	Low power consumption
3	<5 min	Understand how many objects are in field, their shapes properly and determine their positions correctly	<50 \$	User friendly GUI and live mapping	Works properly in laboratory and fair field for both dark and sunlight conditions	<10 W
2	5-10 min	Understand how many objects are in field and their shapes properly, but cannot determine their positions correctly	50-150 \$	User friendly GUI but long update duration of data	Works in laboratory everywhere but sometimes cannot operate properly on fair field ground	10-20 W
1	10-15 min	Understand how many objects are in field but cannot determine their position and shapes correctly	150-200 \$	User friendly GUI presenting data transmission at the end of operation	Works only at specific conditions in laboratory	20-50 W
0	>15 min	Number of objects, their shapes and their position cannot be determined correctly	>200 \$	No user-friendly GUI and no real time data processing	Sometimes works, but sometime does not work in any condition	>50 W

Operation Time: This objective means the required time for finishing the mapping task.

Accuracy: how accurate our robot for tasks such as determining positions, shapes and number of objects. For now, we do not have ability to quantitate numbers for error rates since we have not made experiments yet. After experiments, we will also define some error range which are important for our project.

Low Cost: this objective is also important for us and we will try to reduce costs by determining our solutions.

Ease of Use: The GUI which will show us the map of the environment should be user friendly and if data processing is online, this is plus for our project.

Robust Operation: This is most important objective for us since we want our robot to operate in any environmental conditions.

Low Power Consumption: We will try to reduce power consumption as much as possible. This will reduce the cost and also will increase the expected lifetime of the device.

We brainstormed about solutions to our subsystems or to the requirement that our robot must do. Some approaches to requirements that we found up to now is listed below.

	Ideas			
Motion in 2D Direction	Robot moves and scan the field randomly	Robot moves referring the boundary of the plane	Robot passes through the objects mainly referring to the boundary	Robot has complex algorithm that determines its shortest route
Self-Localization	Robot take reference as starting point and makes vector addition during motion	Robot takes references as the boundary of the plane	Robot uses GPS to position	Robot gets self-position by taking reference according to objects in the field
Objects Localization	Robot finds distance of objects using vector addition to reference point	Relative positioning according to surrounding objects in the plane	Robot finds its position by measuring position vectors from the boundaries.	
Data Processing	Onboard processing and live updating of map	Map generation after all the measurements are taken		
Processed Data Transfer	Output can be stored in a storage element and at the end of operation mapping output can be taken	Using Bluetooth, map can be transferred to screen	Using Wi-Fi, map can be transferred to screen	Using RF link, map can be transferred to screen