RaLaZaBa ELECTRONICS
13th Weekly Report

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Done

- Conceptual design report was written as draft. Some parts are in below to take a feedback.

Introduction

In this project, the main objective is to design an autonomous robot which plans a bounded environment containing an unknown number of objects by telling the number of objects, their shapes, and centers, produce a map and send it to the monitor. Moreover, the robot should finish this planning operation in the shortest time, and minimum error as possible. Main features of the robot are:

- To move in x y directions a bounded environment by visiting all regions of the environment
- To make self-localization for detecting the current position of the robot
- To sense objects and bounds of the environment
- To get all necessary data from the objects and environment and combine these data and transfer to the data processing unit
- To process data and determine the number of objects, their shapes and their center information

These main features are also subsystems of our project. The detailed solution approach and subsystems and overall system definitions are in the following sections.

Currently, we made some experiments for our subsystems and determined some possible solutions for our subsystems. At the first stage of the project, we created a system for sensing the environment and processing measured data to determine objects features and its their locations. Then we moved our robot without actuators and collect data with different locations. With our algorithms, the robot can combine data come from different observation points to building the overall map.

Our solution idea is consist of cumulative summation of….

The first part of this report, we examine the detailed problem statement, measurable objectives. Then we explained our detailed solution approaches, our subsystem definitions, overall system definition, and experimental results. The final part of the report is consist of a detailed breakdown of planned work, team's work sharing as well as Gantt chart to present project timeline. Moreover, test procedures, measure of success, cost analysis and deliverable also explained.

Mechanic Design of Devices

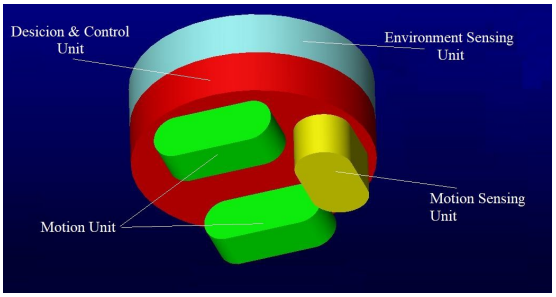

Figure 1 : Engineering Draw of the Mechanic Design

Solution Approaches

Sensing for Motion

The motion of devices is governed by the algorithm that relies on probabilistic models such as SLAM, PAM. In addition, these algorithms are strongly dependent of the environment information and self localization. Self localization means that the device can understand how to move away start point or former point which device is there. So, solution of the self localization problem are argued at the subsystem. There is four solution methods. The methods are stated:

- **2 mouse**

PC mouses have capabilities of tracking position inherently. However, they can only give information about linear motion on the plane, not angular motion. To overcome this problem, we used 2 mouses side by side to detect angular motion using their relative motion. Mathematical derivations and related know-how can found at [x]...

Features

- Precise optical navigation technology
- Small form factor
  (10 mm x 12.5 mm footprint)
- No mechanical moving parts
- Complete 2D motion sensor
- Common interface for general purpose controller
- Smooth surface navigation
- Programmable frame speed up to 3000 frames per sec (fps)
- Accurate motion up to 12 ips
- 400 cpi resolution
- High reliability
- High speed motion detector
- Wave solderable
- Single 5.0 volt power supply
- Conforms to USB suspend mode specifications
- Power conservation mode during times of no movement
- Serial port registers
  - Programming
  - Data transfer
- 8-pin staggered dual inline package (DIP)

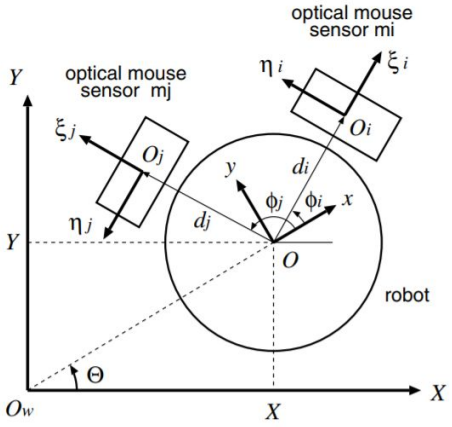

Figure 2 : Abstract of datasheet (a) and an example configuration of two mouses (b)

The mouse has better resolution (about 63.5 μm) relative to encoder option.[x]. Related measurements and test plants can found figure 2a and 2b. Optical mouses can not work every plane due to their nature of electromagnetic wave. Therefore, we test them both in the design studio and KKM hall. Although it worked floor of the design studio, it didn't work at KKM hall's floor. For that reason, we changed our mouse selection from optical to tracked-ball.