Software Requirements Specification

BE Projects 2011-12

Marble Maze

<Group Code>

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Introduction

Marble maze is a game in which you need to control a ball in a maze by titling the device in your hands and leads the ball into goal.

Game is actually based on the classic game that many of us have played when we were little children where tiny ball have to make its way around the obstacles, through the maze, reaching the goal.

1.1 Definitions, Acronyms and Abbreviations

Accelerometer: - An **accelerometer** is a device that measures proper acceleration.

Image Processing:- **Image processing** is any form of signal processing for which the input is an image, such as a photograph or video frame; the output of image processing may be either an image or, a set of characteristics or parameters related to the image.

Servo Motor: - A **servomotor** (servo) is an electromechanical device in which an electrical input determines the position of the armature of a motor.

1.2 References
- www.google.com
- http://sites.google.com/site/teamtobor/marble-maze
- http://www.roborealm.com/
- www.youtube.com

2   Overall Description

Marble Maze is a puzzle where the goal is to make a marble traverse through a maze from start to the end point. This project aims at robotic control for traversing of marble from a defined starting point to the ending point. This can be achieved using:

- ◦ Image Processing System (Computer Controlled)
- ◦ Accelerometer (Person Controlled)

Image Processing:

This task involves using an overhead webcam to process the image and mapping the motion of marble against a pre-designed maze in the computer. This is a computer controlled method to make the marble reach its destination point. In this, the webcam will get the snapshot of the maze and using some algorithm it will find the proper path. After finding the path computer will move the board such that the marble traverses through the maze and reach to end point.

Accelerometer:

This device will measure the acceleration of the marble during its motion across a frame of reference, which in this case is, the maze. This is a manually controlled method to make the marble reach its destination point.
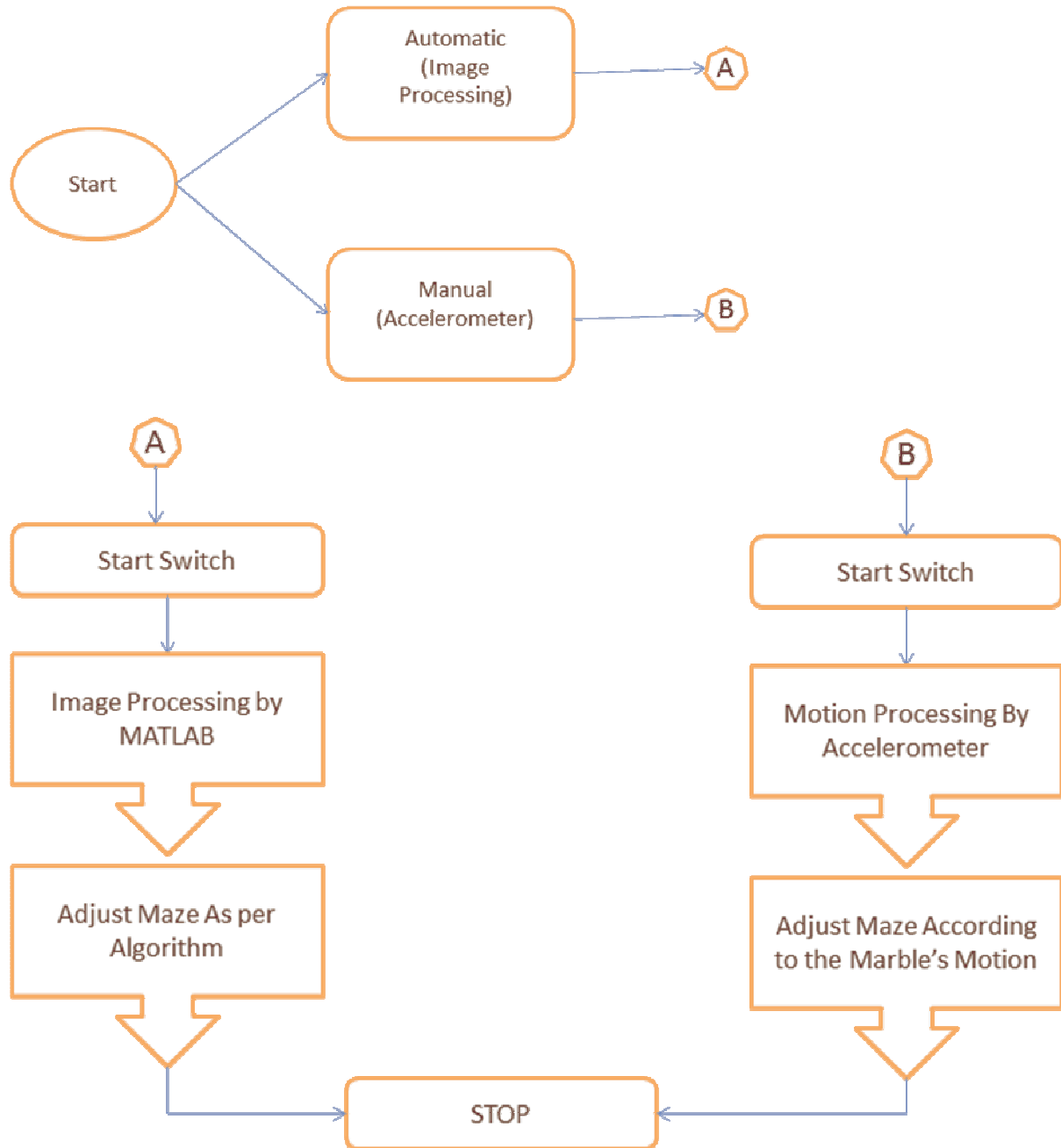
Constraints

- ▪ Distance can be barrier as wired connection of accelerometer to robot.
- ▪ Same distance barrier for image processing too as webcam will be connected to the computer.

Assumptions

- ▪ It is assumed that user knows how to use accelerometer.
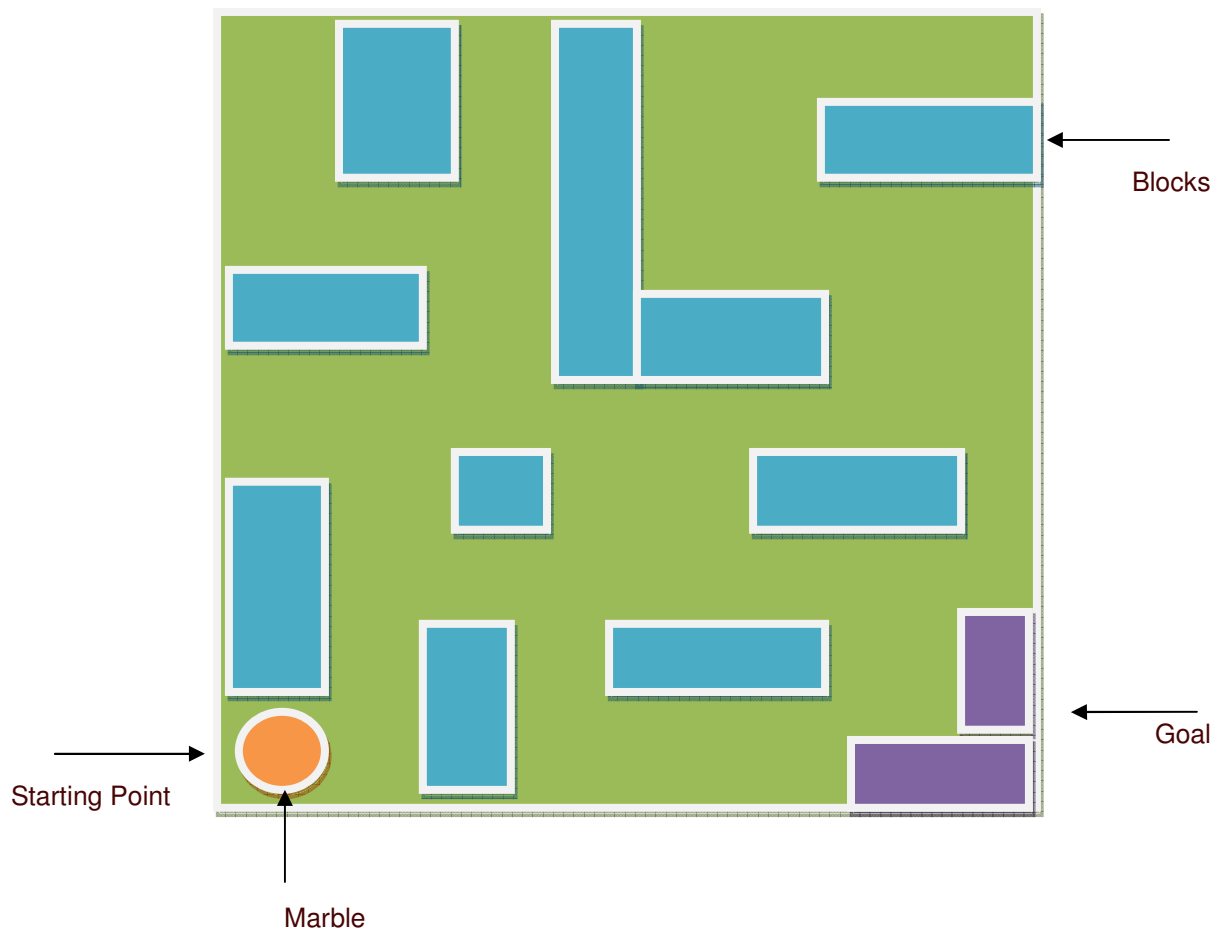
3   Details

3.1   Functionality

3.2   Design Constraints
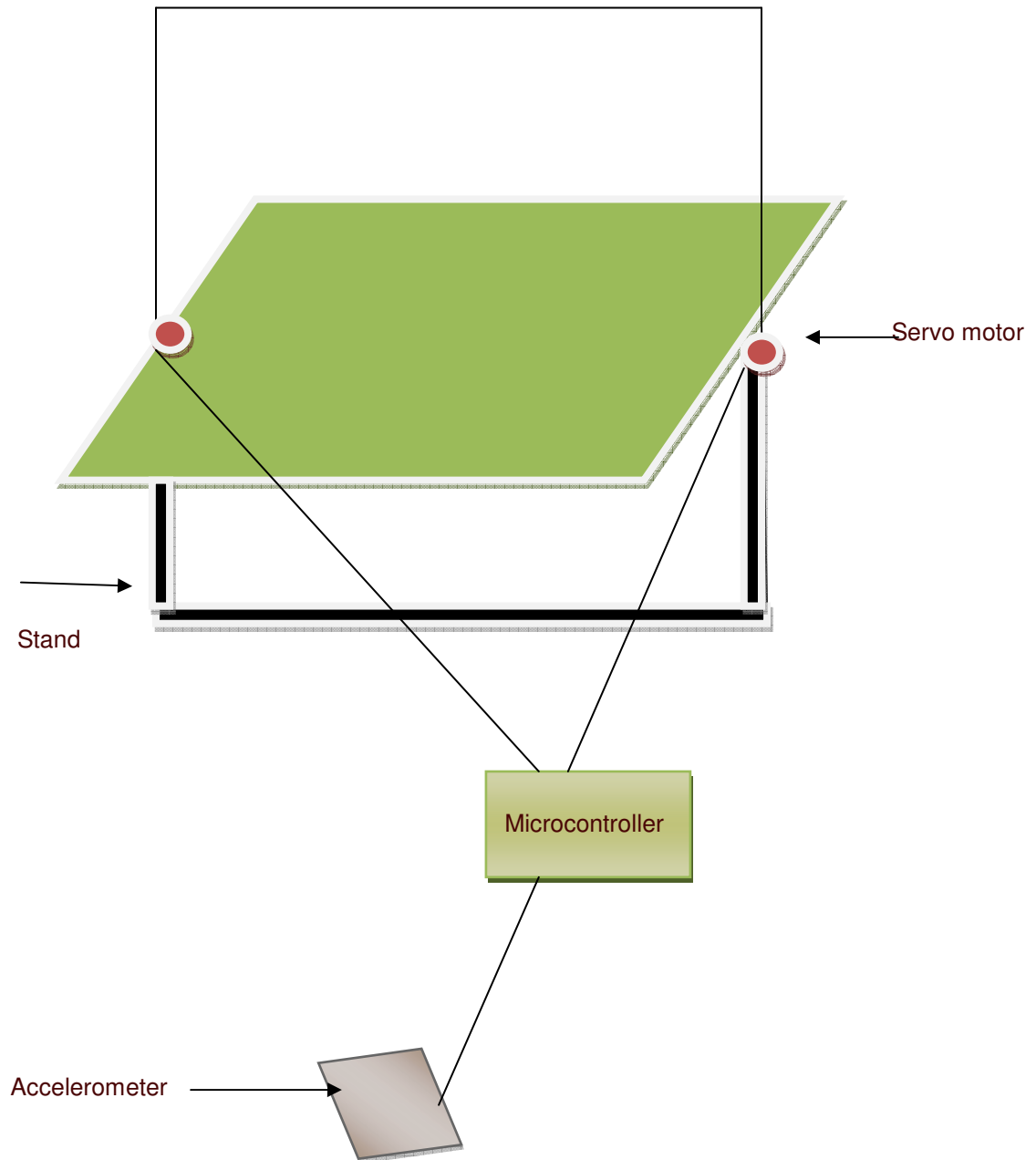
Design for Maze:-

Blocks

Goal

Starting Point

Marble

Design for Image Processing:-

Webcam

Servo motor

Maze

Servo motor

Stand

Microcontroller
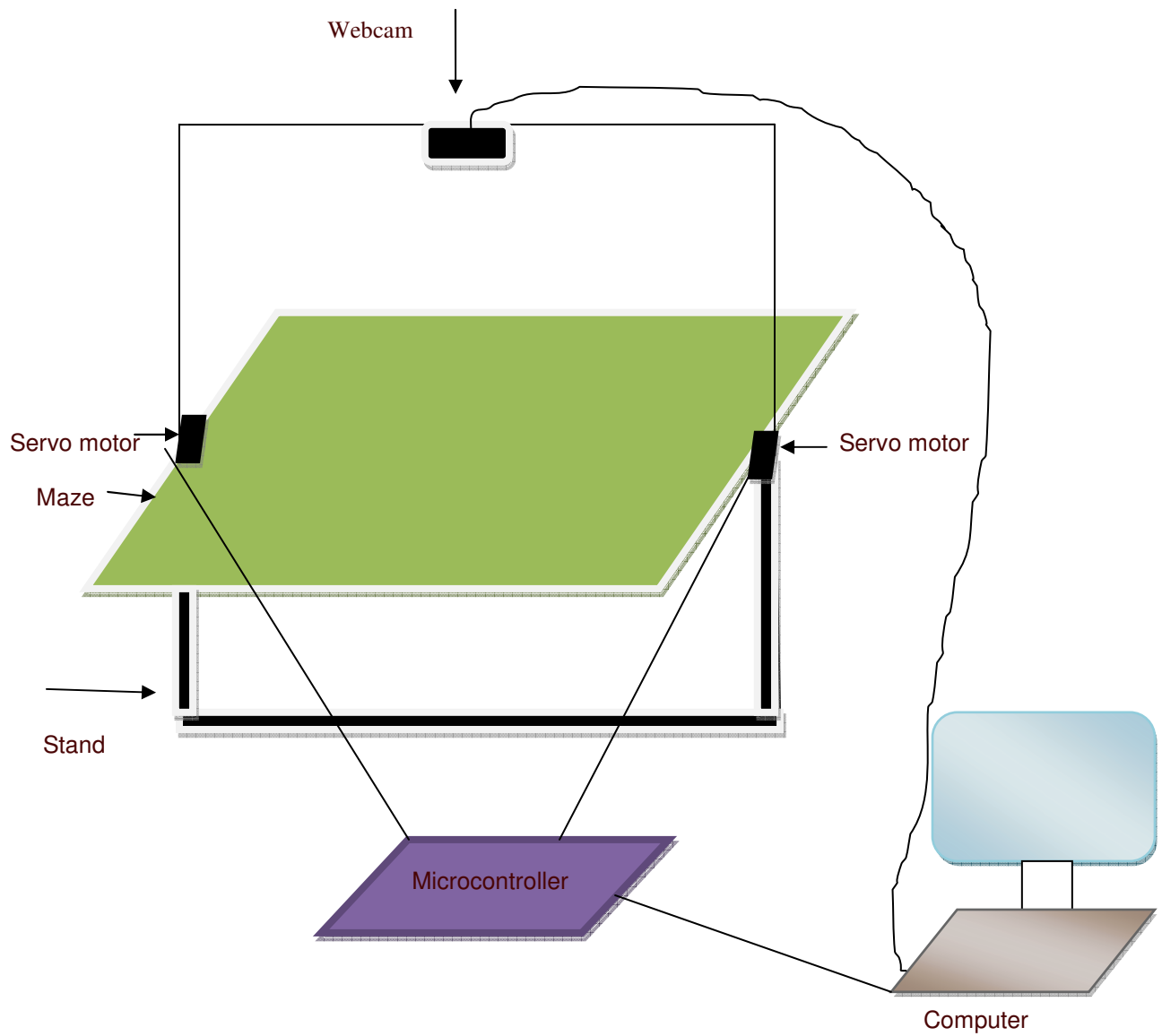
Computer

Design For Accelerometer:-

Servo motor

Stand

Microcontroller

Accelerometer

3.3 Requirement

3.2.1 User Requirement

  o User required for movement of accelerometer.
  o Computer control for Image Processing.

3.2.2 Hardware Requirements

- iBall Face2Face C12.0 Web Camera   :Web camera to capture the image of the
                                        maze
- ATMEGA640 Development Board   : To burn the program and give signals to
                                        Servo motor
- Two axis Low-G accelerometer   :Require 1 accelerometer to give
                                        Movement to frame

- Power Supply
- Marble   : Require 1 marble To move the marble
                                        And solve the puzzle
- Metal gear Servo   :Require 2 servo 1 for inner frame and
                                        2nd for outer frame
- Aluminum Frame   :Require 3 frame outer,inner,1 frame for
                                        support

3.2.3 Software Requirements

- Matlab   :To find the path of the maze
- WIN AVR
- AVR STUDIO   :To program instruction
- AVR BOOTLOADER

4   Quality Control

4.1   Test Data

- For image processing test cases will be:
  - Detecting a ball on board
  - Detecting path
- For accelerometer test cases will be:
  - Control of accelerometer
  - Distance of accelerometer
  - Movements of Servo motors

5   Risk Management

- We are studying Image Processing.
- Solving the Marble Maze using both Image processing and accelerometer has various handoff points.
- In the Accelerometer method, maintaining the equilibrium of the maze at all the points is going to be a tough task. Especially, making it withstand the physical shocks and turbulence caused by the solver or by natural activities like uneven flooring could pose difficult challenge.
- In the image processing method, error-proofing the code for unprecedented issues like someone manually removing the marble from the board might present some unforeseen challenges.