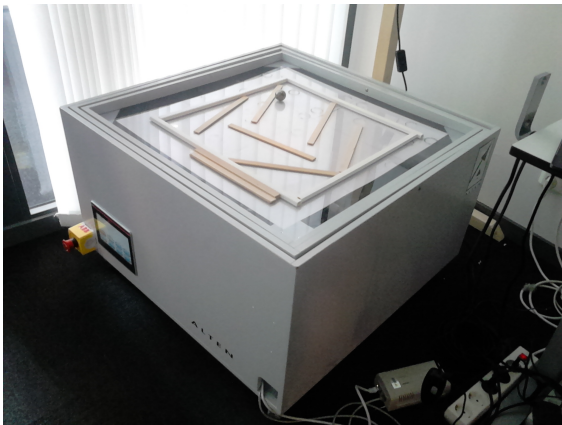# Pathfinding and positioning in a labyrinth game using a wide-angle camera

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The metal ball slowly navigates the maze guided by a Camera generating a safe path avoiding any obstacles. The two servo motors controlling the angle of the playfield vibrates as tilt the playfield to accelerate the ball.


The labyrinth game

The parts of the game

Several functionalities need to work together inorder to perform the task of guiding the ball through the maze. The first part is the tilting of the maze to accelerate the ball, this is performed by two servomotors below the maze controlling the X and Y axis. A industrial control computer (PLC) continously adjusts the angle of the maze through the servomotors to adjust the ball positon. The control algorithm in the PLC is capable of moving the ball along the maze or keep it stationary at a arbitrary point. In order to control the ball, the algorithm need feedback of where the ball is located and that is accomplished by a AXIS camera mounted below the maze, capturing the backside of the maze and the shadow of the ball. Software in the camera capture each imageframe and based on the round shape of the ball calculates the position. These parts are needed to position the ball in the maze and runs autonomouslly, freeing the player and navigation software from the task of controlling the ball. What is needed then is to tell the PLC the position to put the ball at within line of sight from the current ball position.

A second software running in the camera has the task of guiding the ball past any obstacles or walls of the maze to a final destination. A picture of the map from the camera is used to identify all obstacles in the maze, this is done once before the game is started. A software algorithm then decides on the best path to the destination from the current ball position and passes that information on to the PLC wich guides the ball from

point to point towards the final destination.

A Android tablet is used by the player to control the game, it shows a image of the maze and allows the player to select a arbitrary destination point in the maze.
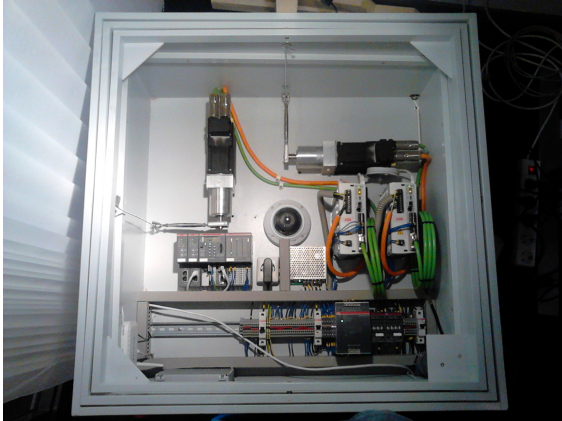
Inside cabinet - PLC and Servomotors

The work

The thesis has created the different algorithms in the camera needed to find and control the ball as well as guide it through the maze. Image filtering to smooth out lens distortion has also been performed. A different aspect of the work has been to integrate all the diferent parts in the game and get all things working together, the PLC, the Camera and the Tablet.