Programmer's Guide to the Cozmo Tile Game

Table of Contents

Introduction

This guide is for technical users and future programmers of the Cozmo Tile Game. It explains how the game works and the objective, provides technical specifications and code and installation instructions, and includes future ideas for game development.

Game Objective

The objective of this game is for Cozmo to find a Power Cube that the player sets on the board. The player creates a maze on the game board using direction tiles object markers (direction tiles), which lead Cozmo to the Power Cube. Cozmo goes through that maze by reading the object markers; once he finds the Power Cube, he performs an animation.

How It Works

Cozmo will look at the symbols and these symbols will then tell cozmo what his next action will be. For example if he were to recognize the circles symbol he will turn right. He will then continue on the path of the tiles recognizing each symbol. This path will then get him to the cube where he will do a little animation to notify that you won.

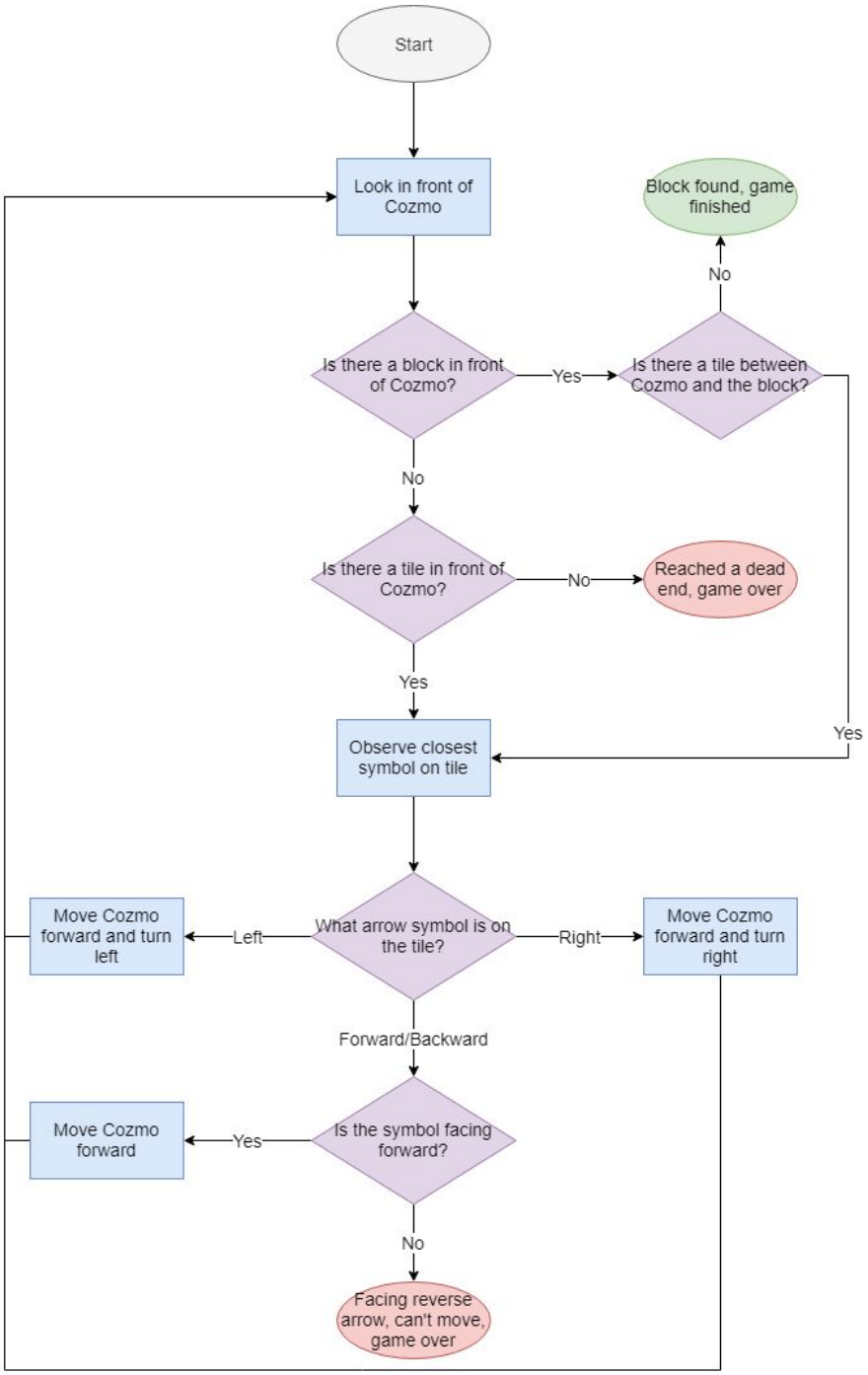
Game Set Up

Connect Cozmo to the phone, and connect the phone to a PC that can run the Python program. Then, set the direction tiles on the board to create a maze that Cozmo can follow. Set the Power Cube at the end of the maze and set Cozmo at the start of the maze. Then run the Python program on your phone.

Cozmo Logic

When the Python program runs the game, Cozmo recognizes the object markers placed on the game tiles by the player. Cozmo reads each marker and makes a move based on the object marker it sees. Cozmo follows the logic in the flowchart below until he has found the Power Cube, at which point the game ends.

Program Flow Chart



Technical Specifications

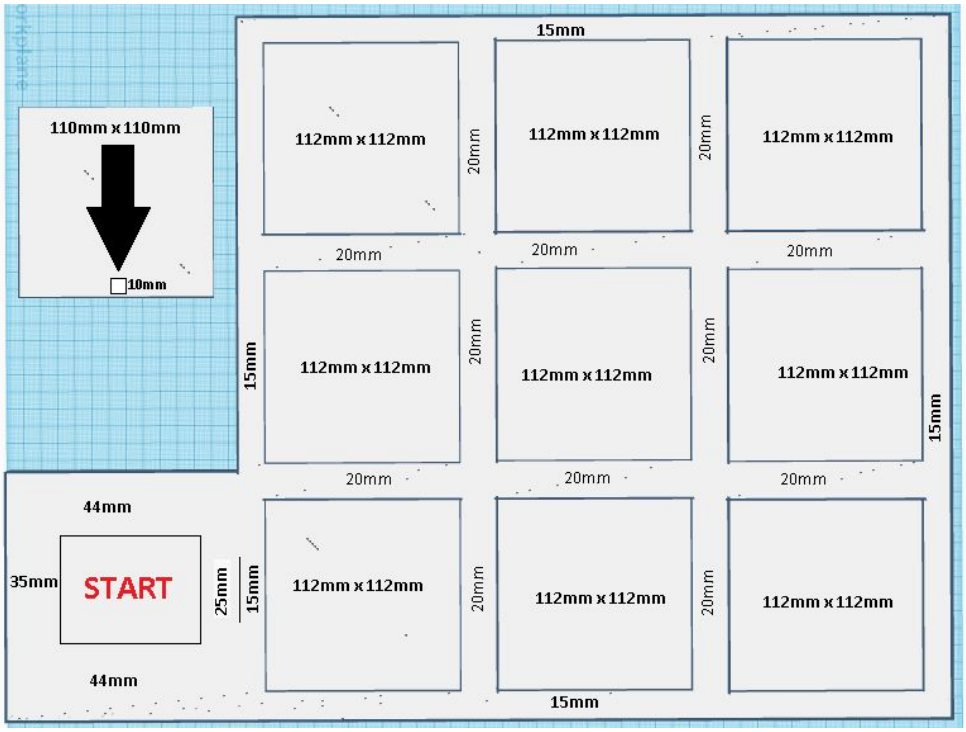
There are several different components to this game; this section lists the components and technical information about them, in case you need to fix them or recreate them from scratch. You can find most of the board materials at a local hobby store or online.

Required Game Board Materials

You can find most of the board materials at a local hobby store or online.

- Foam core for both the board and the tiles.
- Just a black marker or any color to show the markers.
- The markers as shown

Game Board Diagram



Game Board

Specifications

- 2-ply Foam Core
- 548mm x 406mm initial size

- 9 112mm x 112mm square cuts with 20mm space between each cut
- 55mm x 72mm starting square

To create the game board:

1. Take one sheet of foam core with the dimensions at least 548mm x 406mm.
2. Take more foam core and make a second layer for the tile spaces and the second part for the starting position for cozmo.
3. Make sure the tile spaces has enough room for the tiles and the ability to remove said tiles.
4. For the sizes of the tile board it is recommended to look at the given image for the recommended dimensions of everything.

Game Tiles

Specifications

- Foam Core
- 110mm x 110mm size
- Black marker arrow noting direction (Does not matter where arrow is located)
- 10mm x 10mm object marker placed below direction

To create the game tiles:

1. Print out the required symbols for the straight arrow, and the left turn arrow and the right turn arrow.
2. Cut a tile out from the foam core with the dimensions of 110mm x 110mm.
3. Draw the necessary arrow on the tile that will correspond with the object marker. (Circles for right, Diamonds for left turn, triangles for forward, hexagons for backwards).
4. The symbols should be located at the bottom of the tile underneath the arrow so cozmo can see the symbol.

Object Markers

You can find a full range of object markers in the Cozmo Github repository:
https://github.com/anki/cozmo-python-sdk/tree/master/docs/source/images/custom_markers

We used four of the object markers for this game:

- Circles2 – Right Turn
- Diamonds2 – Left Turn
- Triangles2 – Forward
- Hexagons2 – Backward

Specifications

To create the object markers:

1. Download the marker for the corresponding direction.
2. Use an image-resizing tool to change size of the image to 10mm x 10mm size.
3. Print the image of the marker.

Code

1. Make sure you have the code ready and able to use through pycharm.
2. You can get the code from the github link located farther down in the programmers guide.
3. In the code it will tell you what each part of the code does to make this program work.

Installation Instructions

The following instructions will tell you how to either use the code, or look at the code and adjust it to your specifications.

Required Hardware

- A Cozmo robot
- A compatible mobile device to run the Cozmo mobile app
- A computer running Windows, macOS, or Linux (ideally Ubuntu)

Required Software

- Cozmo app
- SDK installation
- Pycharm

To install Cozmo, you are required to use a computer and either a tablet or a smartphone. You will also need to connect the smartphone or tablet to the computer.

Windows/iOS Installation

https://www.youtube.com/watch?v=gtRS3iqzSuA

Windows/Android Installation

https://www.youtube.com/watch?v=9TJeK_AEFYo

After you install Cozmo, Python, and Pycharm, download the project from the Github and open it in Pycharm. Once you open the project, run the program and Cozmo does the rest.

Github Project

You can find code for the project in the Github repository:
https://github.com/AlexDaigre/cs4500_groupProject

This Python code is fully open-source.

Software Development Kit (SDK)

SDK Documentation

http://cozmosdk.anki.com/docs/

This would also help you with installing the SDK if the youtube videos on installation are not clear enough.

Future Additions

We have included some ideas for future additions to this project.

- You could add detection for mazes that take Cozmo off the board. It would make the games go faster.
- You could add more types of direction tiles (object markers) to make Cozmo do different animations. We only use four object markers for this game.
- You could change the direction detection to machine learning, using Tensorflow.
- You could make the board larger to build bigger mazes.