

Accessible Robotics: Developing an Interactive Game for Visually Impaired Children Using Tactile Blocks and Robots.

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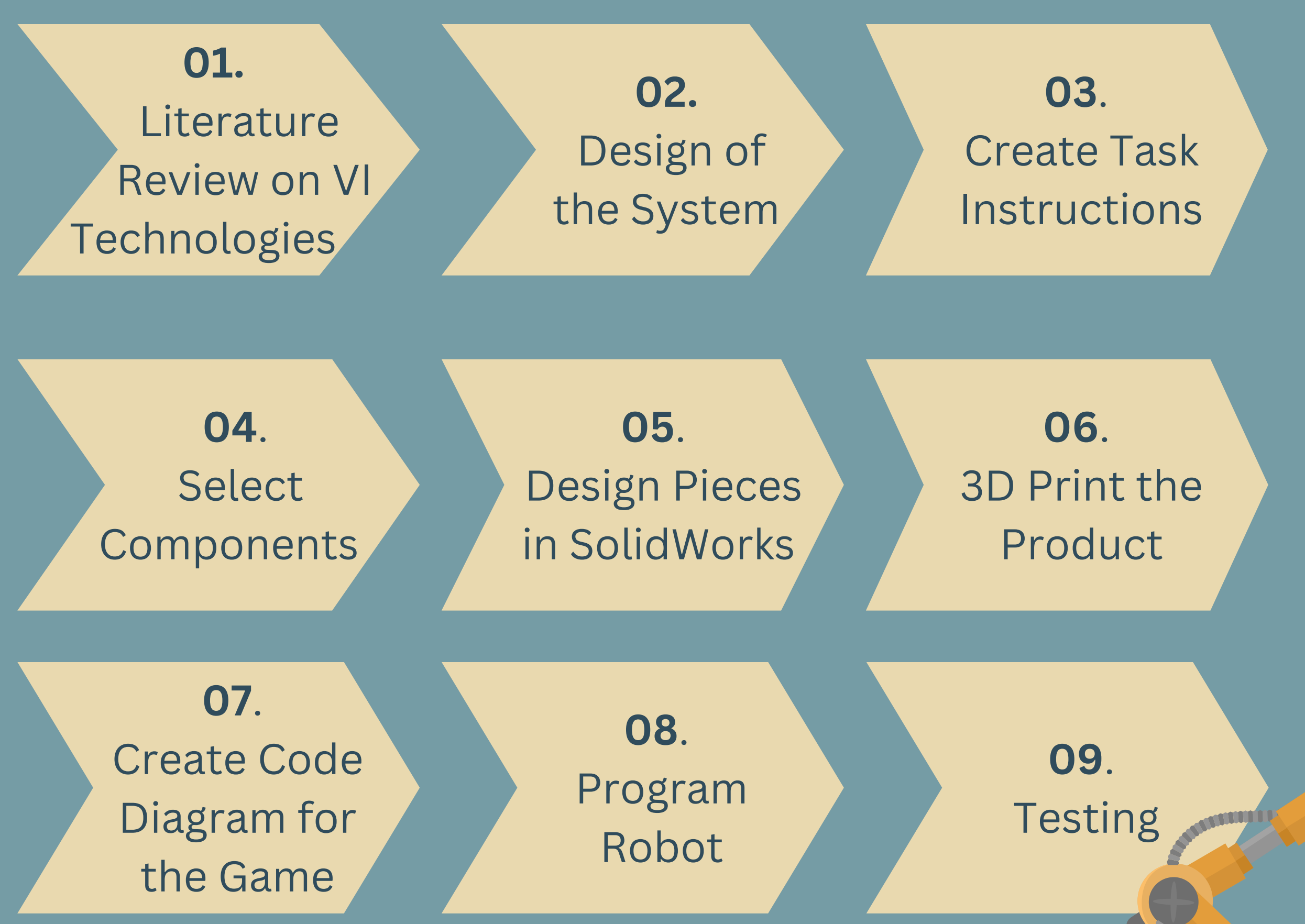
Background

- Visually impaired (VI) children face many struggles in educational settings in comparison to their sighted peers. There are a lack of available curriculums, and teachers with the proper education to teach VI children (1)
- Only 1 in 100 VI people chose to go into post-secondary to further their education. STEM is a particularly difficult field for VI people to break into due to its technical notations and visuality (1)
- Gamification takes strategies used to make video games entertaining and applies them into learning contexts to make learning more fun and engaging (2)

Objective

- Create an engaging and interactive game using robots for VI children
- Include components to make the game educational, train fine motor skills, and increase independence

Methodology



Results

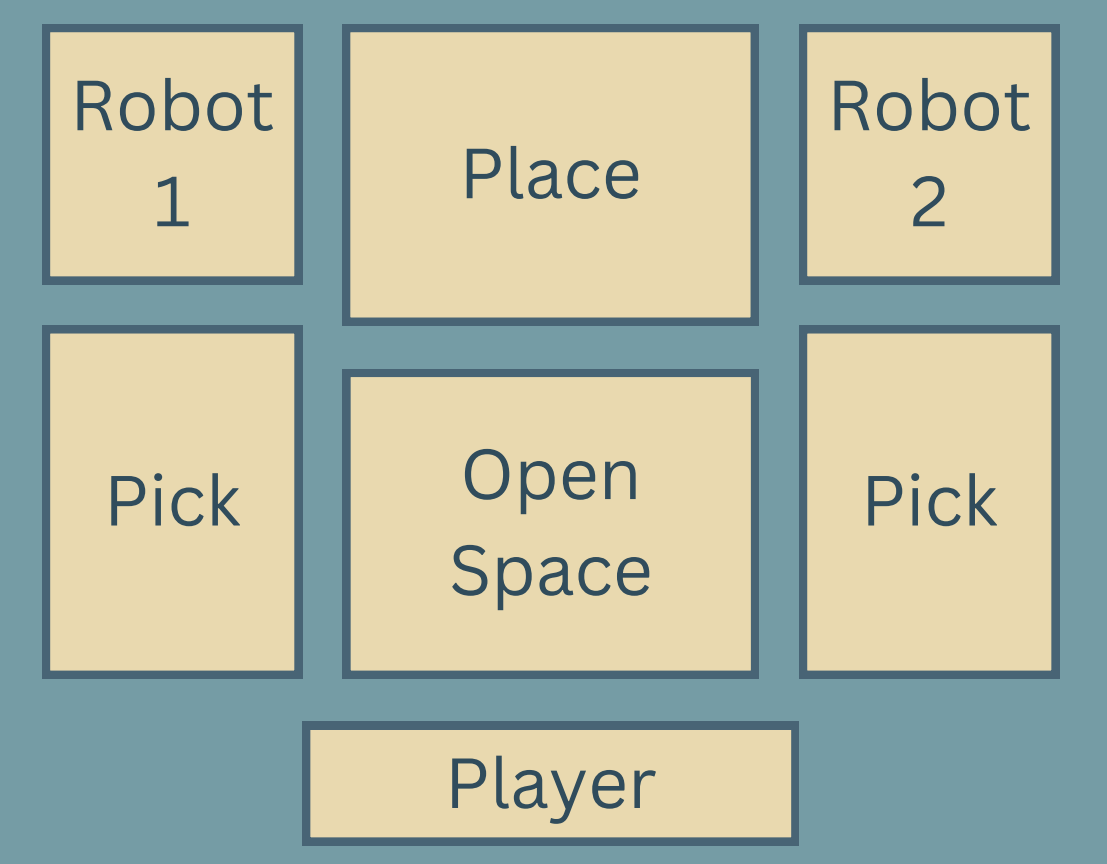


Figure 1: Sketch of game and robots



Figure 2: Prototype of the game and robots

The final prototype uses two robots working together to build the desired shape with the assistance of the player.

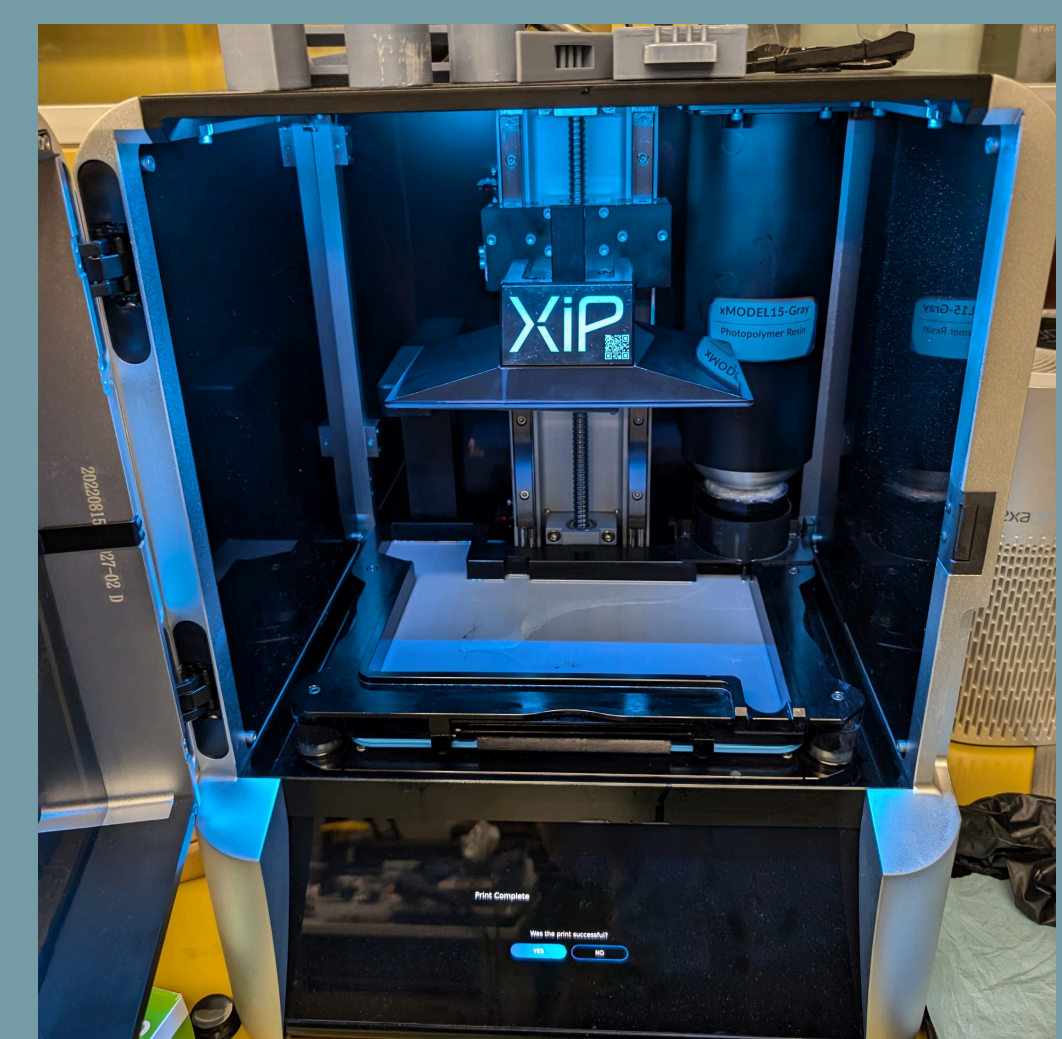


Figure 3: 3D Resin Printer

• A 3D resin printer uses stereolithography to create intricate and detailed 3D shapes by shining a light onto the build platform in the shape of the object, curing the resin, until the final shape is created

• This technology was used to prototype some of the shapes and could be further used to put braille onto the shapes

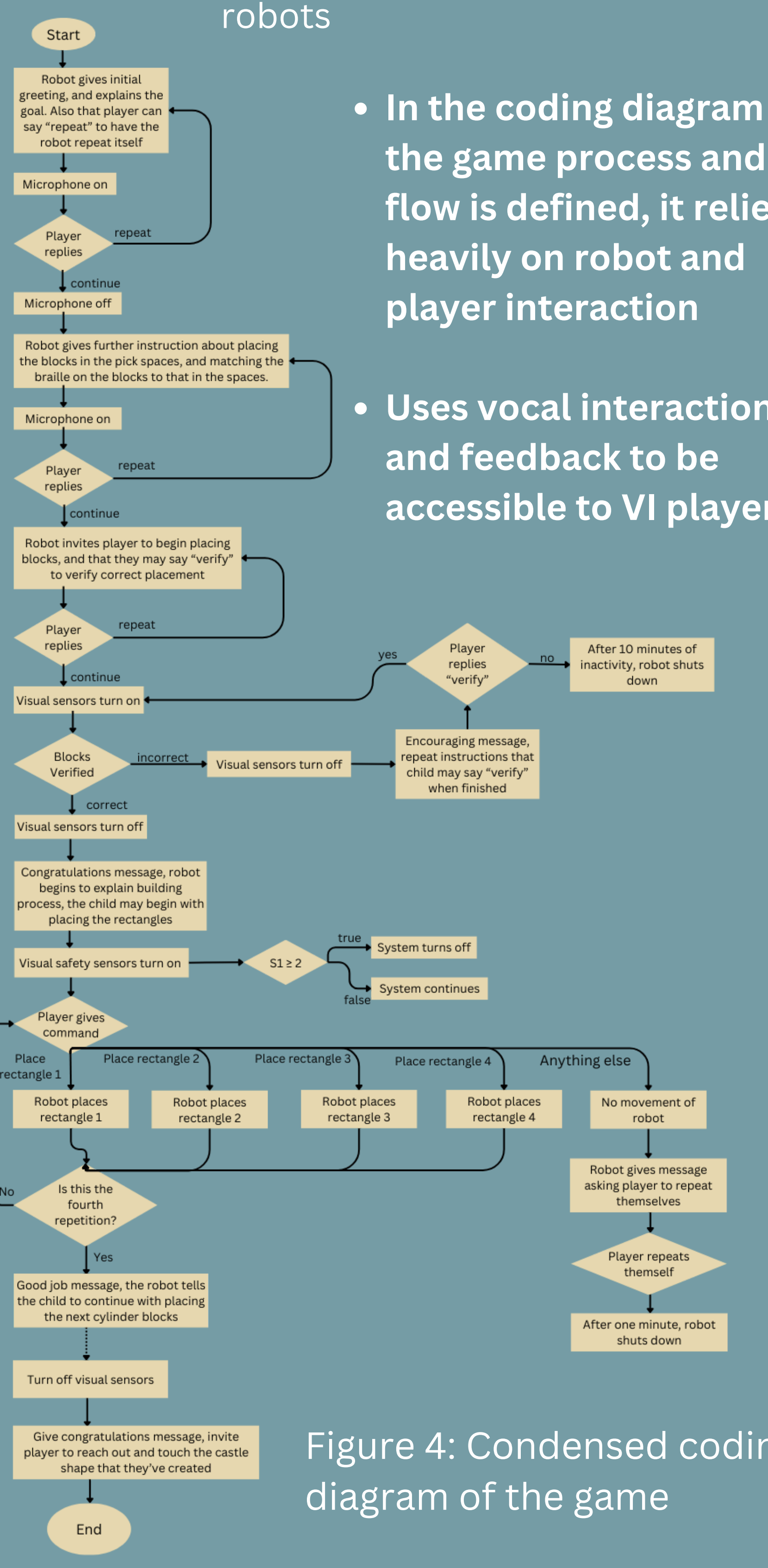


Figure 4: Condensed coding diagram of the game

- In the coding diagram the game process and flow is defined, it relies heavily on robot and player interaction
- Uses vocal interaction and feedback to be accessible to VI players

Conclusions & Future Work

The game designed fosters interest in scientific subjects for visually impaired people and aims to eventually help bridge accessibility gaps in games and education.

Future work on this project could incorporate:

- Improving and/or implementing the following components
 - Vibrations
 - Provide warnings to the player, and keep the player aware of where the robot is
 - Microphone & Speaker
 - Allows the player to easily interact with the robot without the use of inaccessible controls
 - Visual & Proximity Sensors
 - Important safety element of the game, will trigger the robot to stop if a limit is reached
 - End Effector
 - Part of the robot used to pick up the game pieces
- A player feedback stage, in which VI players are able to try out the game and provide feedback
- Using the resin printer to put braille onto the shapes for easier identification of specific shape names
- Developing the game into a way that it could be available for use in schools or other institutions

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References

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