Design

Figure 2 shows the high-level structure for Grand Math Auto with an architectural diagram. The diagram shows how the player interacts with the system through a graphical user interface. The player accesses menu screens including options, and the more dynamic gameplay system which access the math and vehicular components of the game. Figure 3 shows the high-level behavior for Grand Math Auto through a state diagram. The diagram shows how the user will access various areas of the application through the interface options and game events.

[1] High Level Design

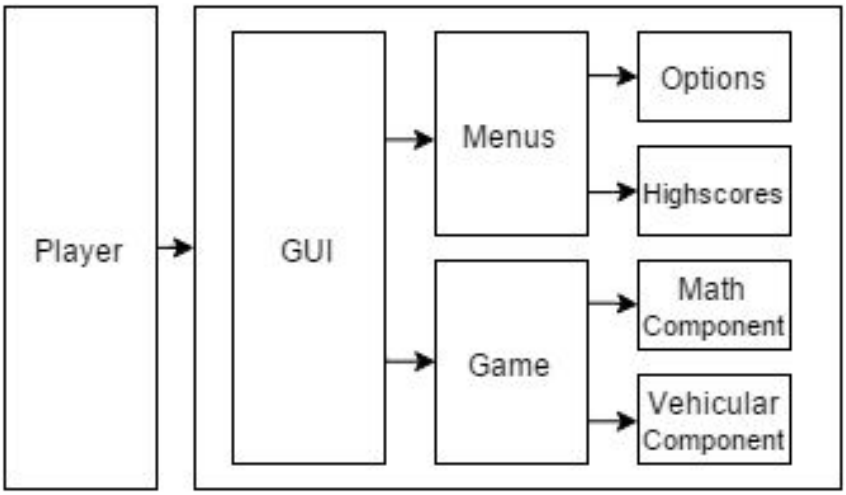

Fig. 2: Structural Diagram for Grand Math Auto.

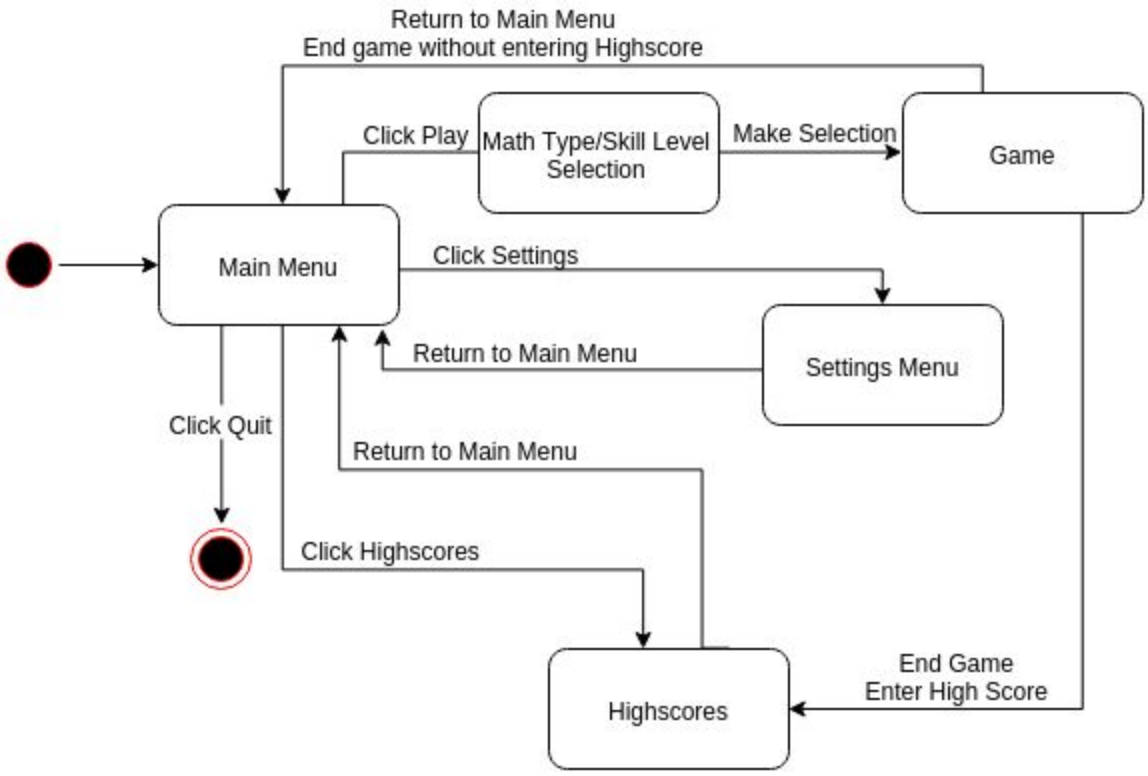

Fig. 3: Behavioral Diagram for Grand Math Auto.

[2] Static Interface Design

Figure 4 shows the main menu screen for Grand Math Auto. We chose to go for a simple list to accommodate our audience. Since the players of our game will most likely be young children, we want them to be able to have a simple to understand and straightforward menu. We also chose to go with light colors to make the game seem more fun and laidback.

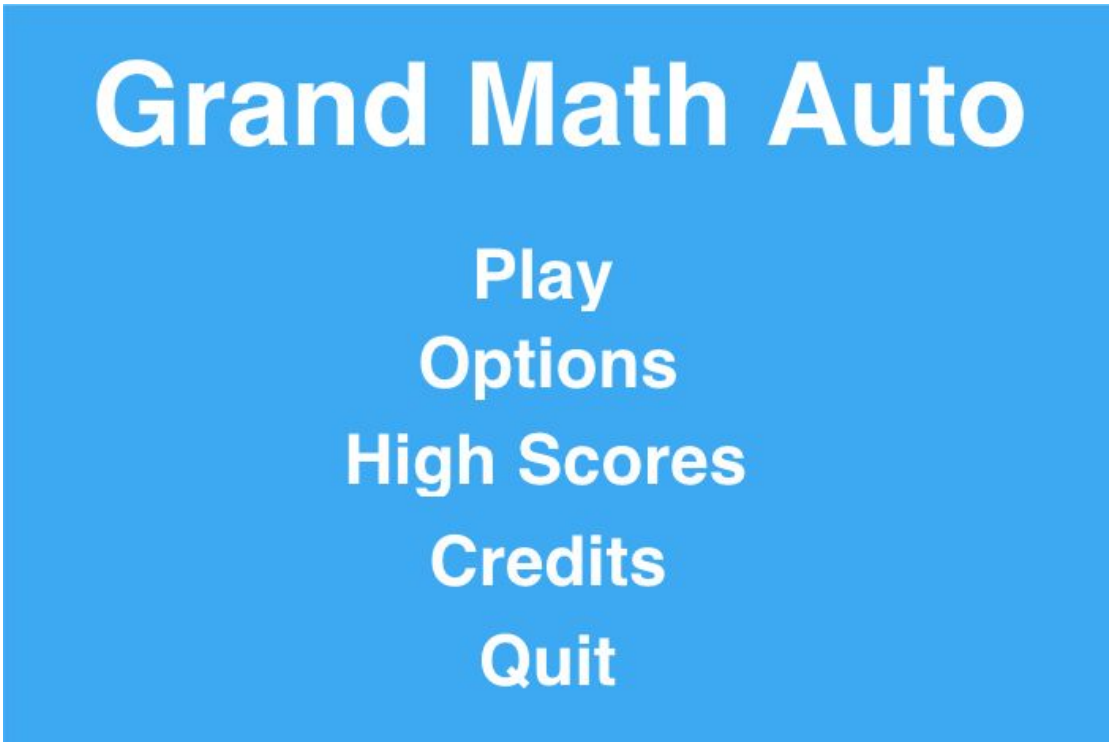

Fig. 4: Main menu of Grand Math Auto.

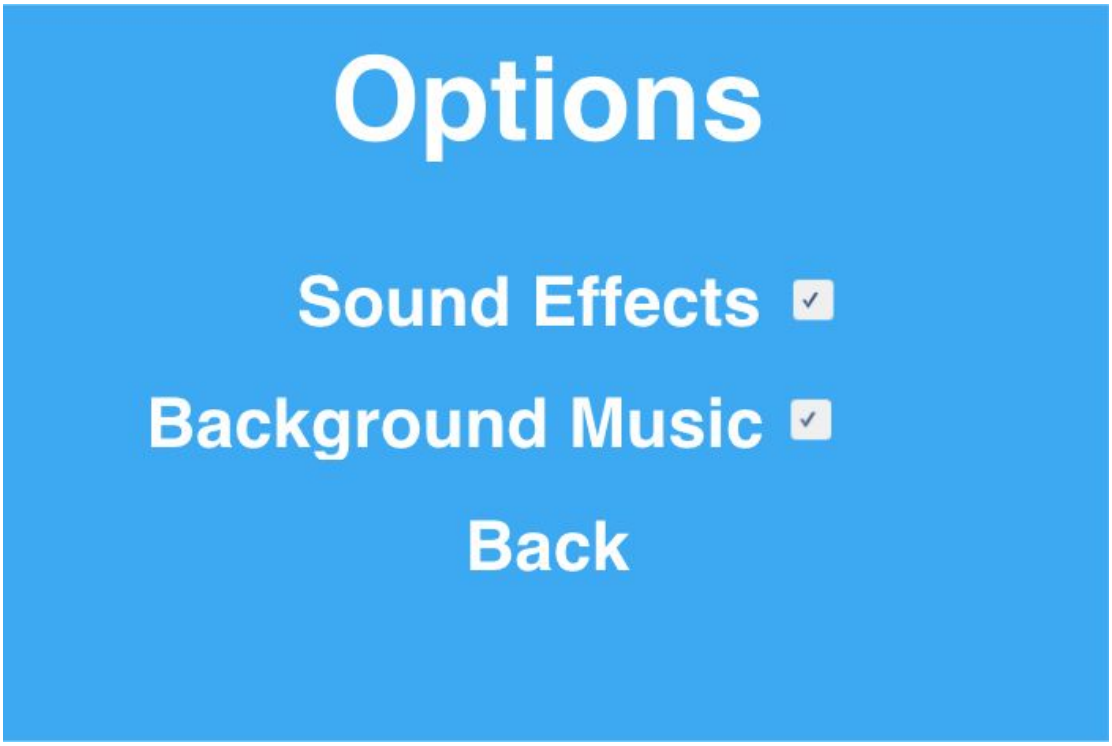

Fig. 5: Options menu, allows toggling audio on/off. The options are kept simple so the user is not overwhelmed.

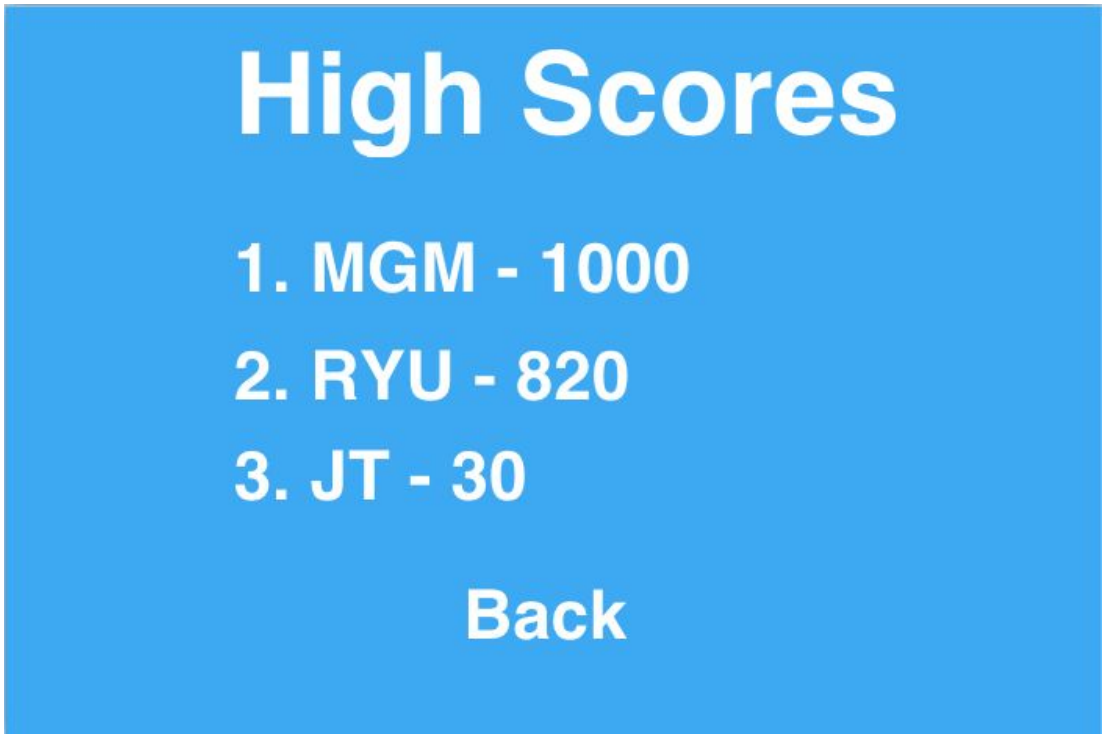

Fig. 6: High scores list. Displays player's name and corresponding score

Fig. 7: Connecting to device screen. Informs the user that the game is attempting to connect to an Android Wear device.

Fig. 8: Skill selection screen. Allows the user to select what types of math problems they want to see in the game.

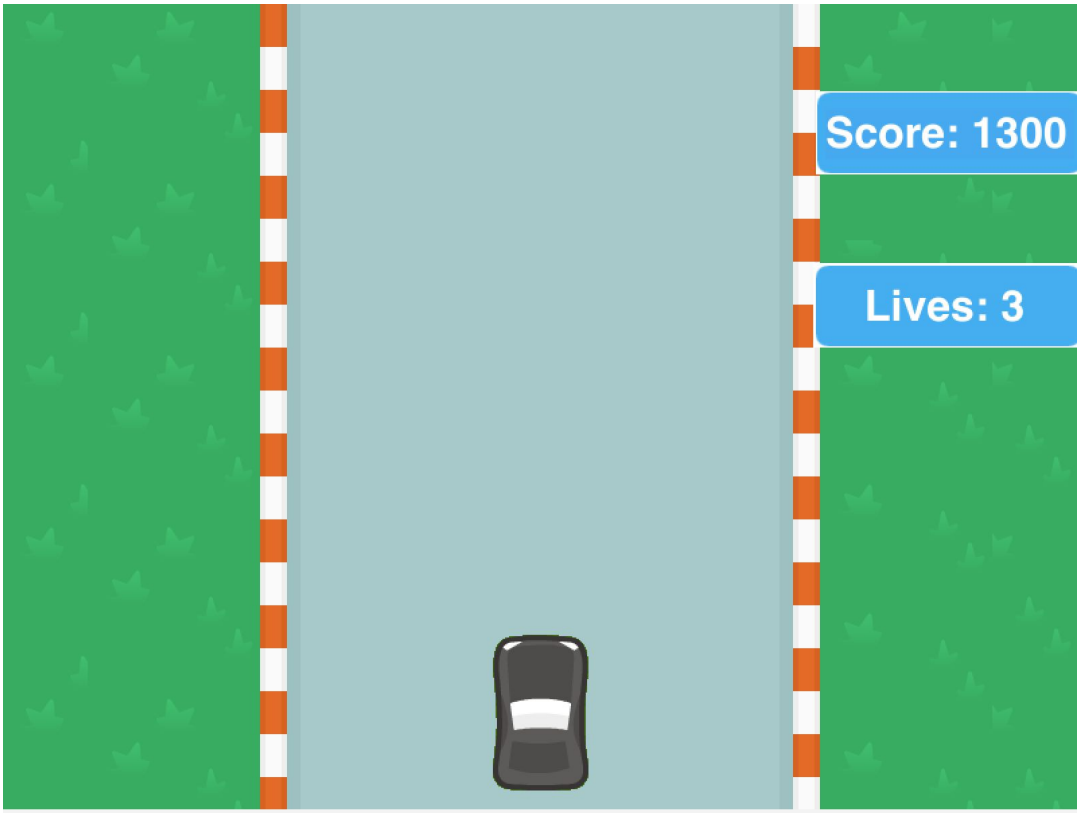

Fig. 9: Game screen. Important game information such as the amount of lives remaining and the current score is shown.

[3] Alternative Design

Figure 10 shows an alternative layout that could use the Android Wear device to navigate the menu rather than the traditional linear menu. The user would rotate the Android Wear device in order to change the current selection, and would hit a keyboard button to select. The currently selected option will always be centered and larger than the other options. This type of menu may be more difficult to navigate and also more difficult to implement.

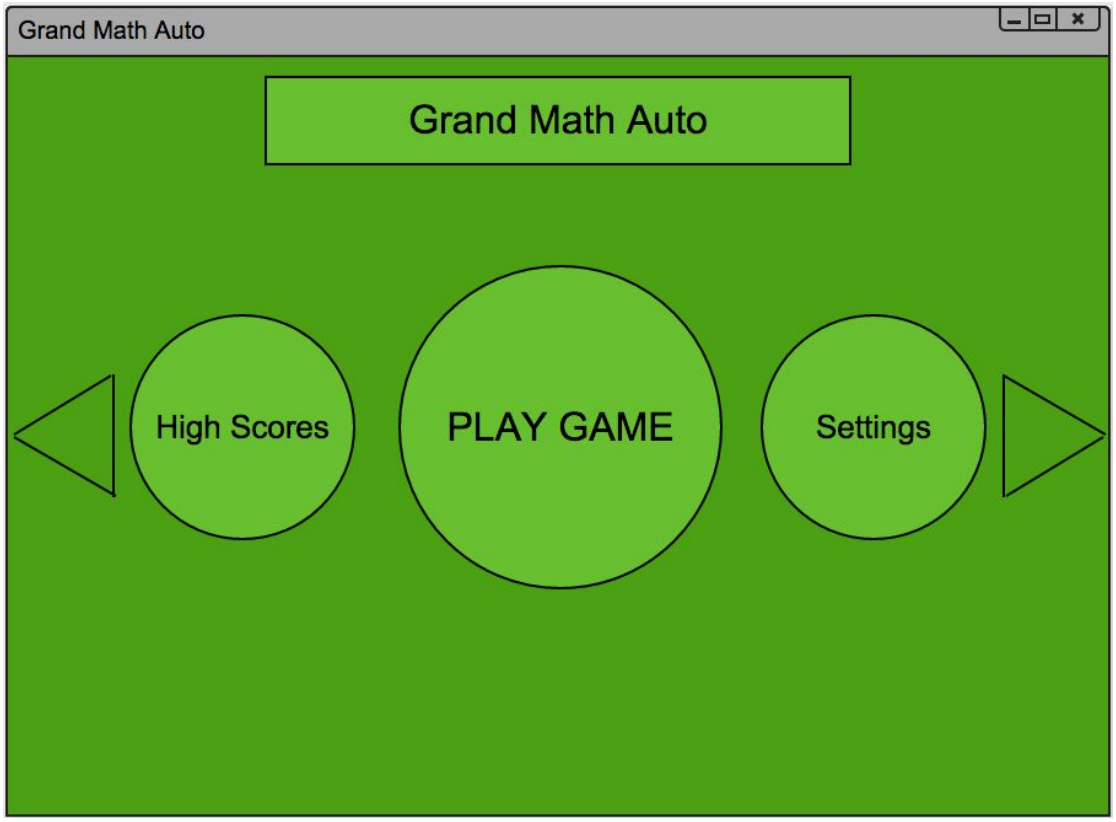

Fig. 10: Alternative main menu screen.

Another option we can attempt for the game interface is to strip the screen of all information, and have it purely focus on the game, as shown in Fig. 11. Then, we can display the score and remaining lives information on the Android Wear device itself, as shown in Fig. 12.

Fig. 11: Alternative game screen with minimalistic on screen information so that the information can be shown on the Android Wear device.

Fig. 12: Information screen for the Android Wear device.

List of References

[1] Amory, A., Naicker, K., Vincent, J., Adams, C. "The Use of Computer Games as an Educational Tool: Identification of Appropriate Game Types and Game Elements" British Journal of Educational Technology, Vol. 30, 2002.

This article describes a study researching which types of video games and game elements are students found important or useful for learning. The study attempts to identify which game types are most suitable for a learning environment. According to the study adventure games ranked highest because they often include visualization and problem solving.

[2] Ke, F. "Classroom Goal Structures for Educational Math Game Application" ICLS '06 Proceedings of the 7th International Conference on Learning Sciences, 2006.

This article describes a field study on how goal structures in educational math games impact students' math performance. Goal structures include cooperative, competitive, and individualistic goals and students were placed into groups based on these goal structures. It was found that students of different socioeconomic backgrounds preferred different goal structures.

[3] Randel, J., Morris, B., Wetzel, C., Whitehill, B. "The Effectiveness of Games for Educational Purposes: A Review of Recent Research" SAGE Journals, Vol. 23, 1992.

This article reviews recent research in the area of effectiveness of games compared to conventional classroom instruction. The sources reviewed dates from 1963 to 1991 and include 67 studies. The author concludes that subjects with very specific, targetable content are more likely to benefit from gaming, with math showing the greatest percentage of results favoring games.

[4] Xiao, R., Laput, G., Harrison, C. "Expanding the Input Expressivity of Smartwatches with Mechanical Pan, Twist, Tilt and Click" CHI '14 Proceedings of the SIGCHI Conference on Human Factors in Computer Systems, 2014,

This article describes an effort to expand the input options of smartwatches with more degrees of freedom in order to allow enhanced expressivity. The researchers enabled the support of panning, twisting, tilting and clicking to a small wrist wearable device with a touchscreen as a proof of concept.

[5] Kilobolt (website). Retrieved from http://www.kilobolt.com/game-development-tutorial.html

This website is a tutorial in game development using the Java programming language and covers basic games and Android deployable games. Grand Math Auto will be created using the Java programming language with some additional code written for the Android Wear device to allow it to interface with the game.

Contributions of Team Members

Matthew Molloy contributed the following:

- Persona and HCI scenario
- Static interface design
- Alternative design

Jennifer Tang contributed the following:

- Use case diagram & descriptions
- Requirements solicitation
- Formatting & editing of document

Ricky Yu contributed the following:

- Functional requirements
- Structural and behavioral diagrams
- Reference descriptions