Math and Puzzle Games

Google Summer Of Code'24
Idea proposal

Basic Details

- Full Name : Soham Kukreti
- Email: kukretisoham@gmail.com
- GitHub Username: SohamKukreti
- Your first language: English
- Location: Noida, Uttar Pradesh, India
- Timezone: India Standard Time

About me:

I am a 2nd year student studying computer science engineering at Jaypee Institute of Information Technology, Noida, Uttar Pradesh, India. Relevant to the project, I have been programming in python for almost 4 years now and I am familiar with working on open source projects.

I am a core member of the Open Source Developers Community (OSDC) of my college and I love to help people get involved in Open Source. I participated in Kharagpur Winter of Code 2024, A program to encourage people to contribute to open source, as a mentor while also getting familiar with a program like GSoC. Here's my KWoC Mentor Certificate. The project I mentored was an educational platform game to help children learn languages called 'Omilia'. I thoroughly enjoyed the experience of encouraging others and gradually getting them to learn more and contribute. I also gave a talk on 'Omilia' along with my friends at the PyDelhi Conference 2023.

Other than programming, I love expressing my creativity through my music. I also run a small channel where I share my music with the world. I love combining my interests into a single project and that is why creating games is something I deeply enjoy.

My Drive:

I first heard about Sugar Labs from one of my friends some time ago. He recommended me to look into this organization because it aligned with the type of projects I had built at that time. Me and my friends had created a language learning game in a hackathon from my college's open source club, where I have now volunteered extensively over the last year. I have always been interested in python and pygame, especially using it for education and so, Sugar Labs instantly became the right fit for me. Contributing to Sugar Labs over the last few months has taught me a lot of things. I wish to learn more and grow and I feel this is the right place for such growth. While I may not know

everything, I have an intrinsic drive to keep developing myself so that I can provide more value to others.

Relevant Projects and Achievements:

1. **Omilia**: An educational game to help children learn new languages. Created using python and pygame, omilia lays a special emphasis on making the process of learning languages as fun and engaging as possible. It was initially built during a 48 hour hackathon, where it got the first prize, however we later turned it into an open source project encouraging others to contribute to it.

2. **Virtual Arcade**: Created a virtual arcade containing 3 games built using pygame for an online hackathon where I was paired up with strangers. The games are:

   Pong- Tennis like arcade game where the player has to hit a ball with a paddle. The game has a simple bot to play with the user.

   Arrow Shooter- An arrow shooting game where the goal is to hit as many apples as possible

   Space Shooter- A space shooting game where the player has to control a spaceship and destroy enemies.

3. **Interpreted**: Contributed to interpreted, a python interpreter written in python, helped fix 2 issues.

4. **OSDC Events**: At OSDC, I helped organize events such as codejam-v4 (A hackathon with a twist where the participant is paired up with strangers) and meetups on topics like linux distributions, CTFs, Introduction to open source programs like GSoC, etc.

Contributions to Sugar Labs:

Here are the merged PRs I have worked on:

1. Add music and sound effects to Countries Activity
2. Add sound effects to Ball and Brick Activity
3. Add music and sound effects to Cellgame Activity

4. Add music and sound effects to Hit The Balls activity

Here are the open PRs I have made so far:

1. Add Hint feature to Countries Activity.
2. Update Country Names in Countries Activity. Also helped review a pr made for the same activity.
3. Fix Bugs in Countries Activity.

Here are the issues I have opened so far:

1. Incorrect country name displayed in countries activity
2. Feature: Add hint to help user guess country in countries activity
3. Activity fails to open up on sugar packaged environment on ubuntu 22.04

I am also working on a Number Guessing sugar activity, inspired from the GSoC ideas list here.

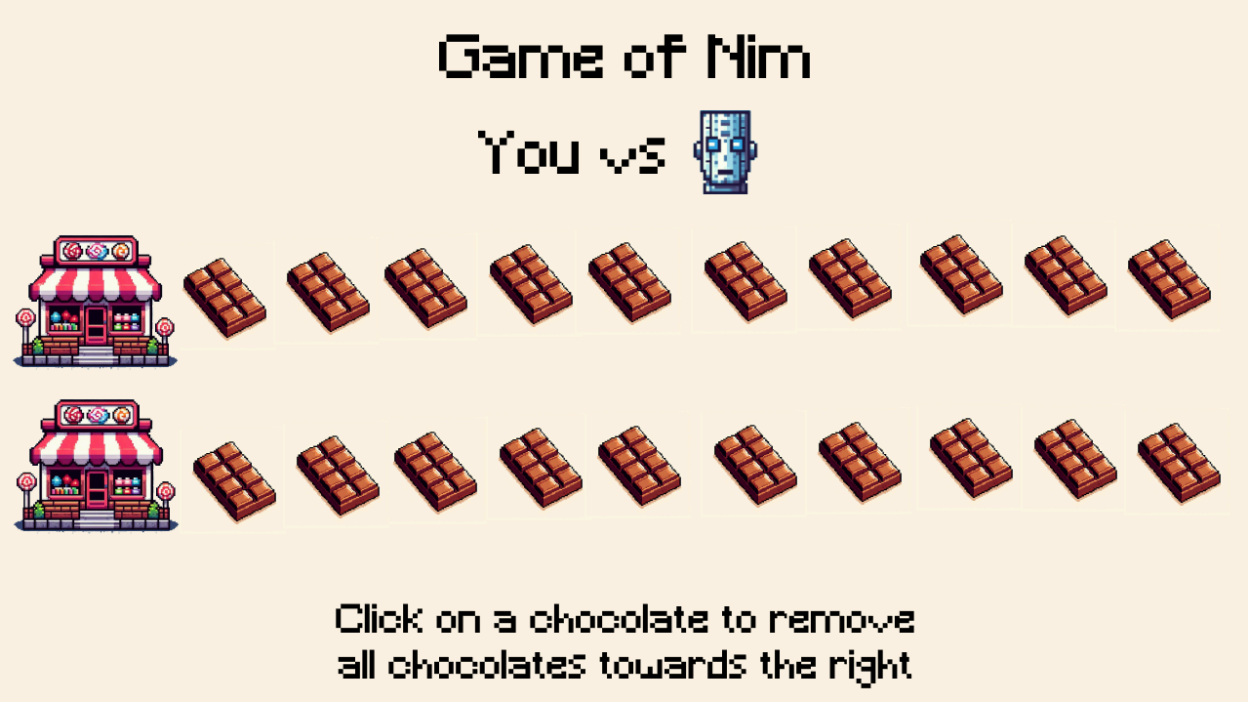
Project Detail:

Synopsis:

Currently Sugar Labs has a handful of math and puzzle activities, most of which involve the user solving mathematical equations and choosing the right option through a gamified format (eg. picking the right ball containing the answer within the time limit). However, there is still a void for more interactive math and puzzle games. This can be solved by adding 6 interactive math and puzzle games which stimulate the minds of the users.

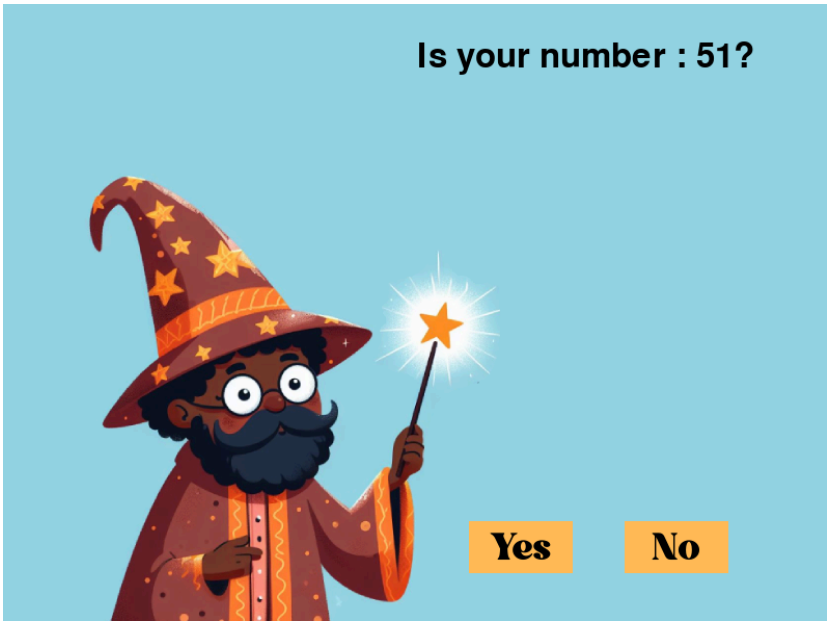
The 6 games which we can add are:

1. **Game of Nim:** The goal of Nim Activity would be to be the player who removes the last of ten chocolates from the computer screen. The player will play against a bot. This activity would test the logic and strategy of the user. The activity could have different variations such as having the option to remove just 1 or 2 chocolates, or having multiple rows of chocolates to increase the possibilities in the game.



(Visual representation of what the activity could look like)

2. **Number Guessing Game:** The user has to think of a number in the range of 1 to 100. At any time, the computer will display a set of numbers. In response, the user will press either "Yes" or "No" depending on whether the number is on the screen or not. After a while the computer will guess the right number.



(Screenshot from Guess the number activity)

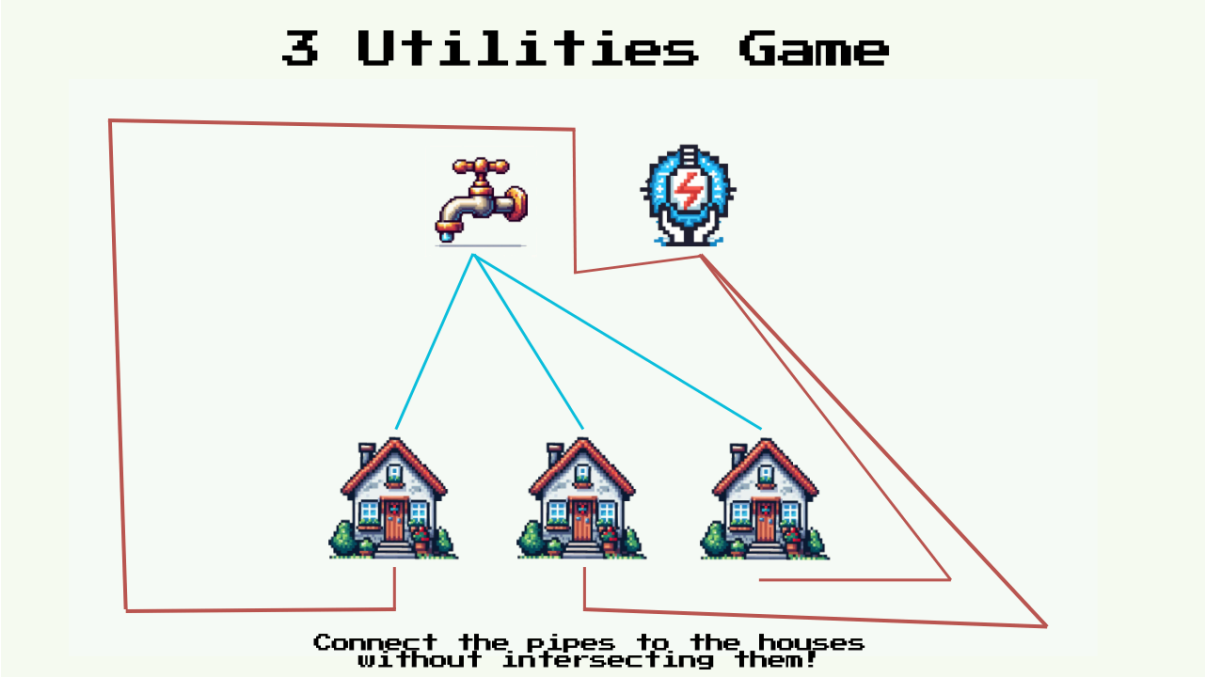
3. **Fish Soup Game:** The user will play against a computer. The goal of the game would be to select three words that share a common letter. The first to select the three words would win. Varying difficulties can be added to the game, the number of letters can also be changed to add variations to the game.

(Visual representation of what the activity could look like)

4. **Goat, Cabbage and Wolf:** A farmer is to ferry across a river a goat, a cabbage, and a wolf. Besides the farmer himself, the boat allows him to carry only one of them at a time. Without supervision, the goat will gobble the cabbage whereas the wolf will not hesitate to feast on the goat. It is the job of the player to transport all three safely across the river. Variations can also be added to this game such as having a fox, a chicken, a caterpillar and a cabbage, where the fox eats the chicken, the chicken eats the caterpillar and the caterpillar eats the cabbage.

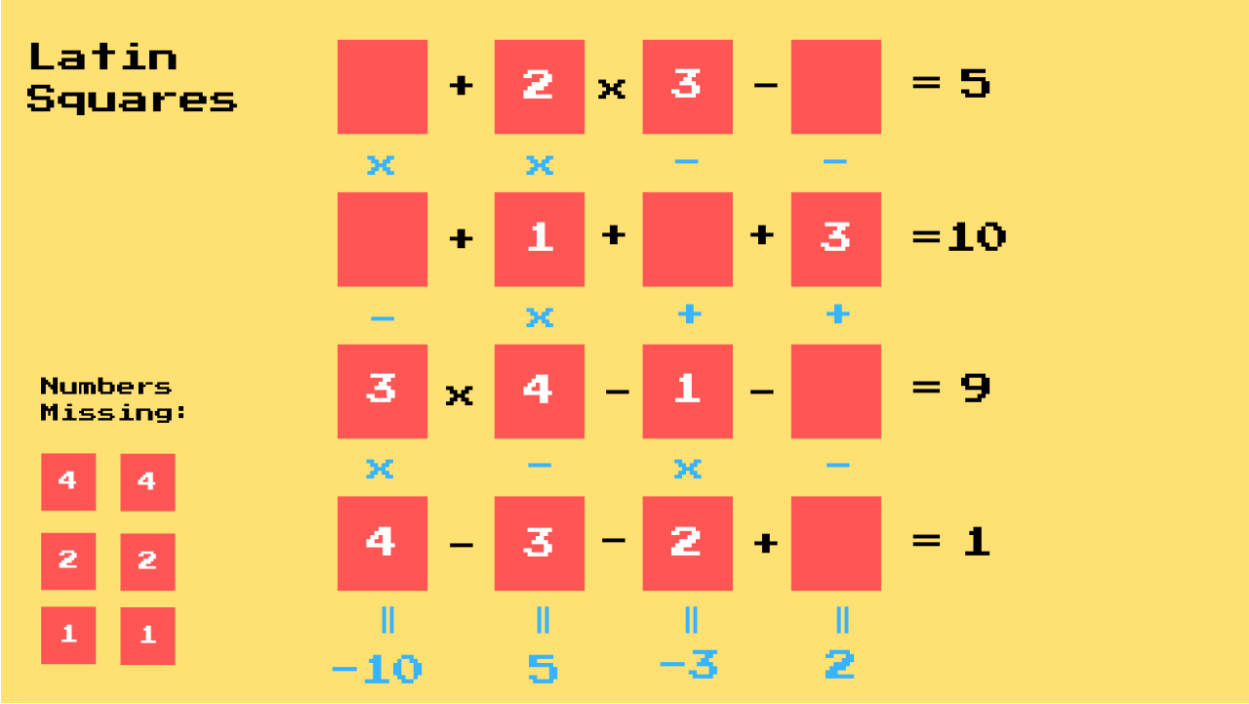
(Actual activity design would be improved)

5. **3 Utilities puzzle:** The aim of the activity would be to lay on water and electricity, from to each of the houses without any pipe crossing another. There could be multiple levels to the activity by varying the number of houses.



(Visual representation of what the activity could look like)

6. **Latin Squares:** The player will be given a 4x4 grid containing some cells filled with numbers and some empty cells. The objective would be to arrange all of the numbers on the grid so that the calculations both vertically and horizontally produce the given totals. Each number on a tile can only appear once in each vertical and horizontal line of four. The completed puzzle will make a Latin Square. The difficulty level of the activity could be varied by increasing or decreasing the number of empty cells in the grid.



(Visual representation of what the activity could look like)

Timeline:

Community Bonding Period (May 1 - 26)

I will make myself more familiar with the different components of Python GTK+ 3 and the sugar toolkit. I will also finish reading the book Make Your Own Sugar Activities by James Simmons. I'll be interacting with the community and the mentors to get familiar with the best development practices. I'll go over my setup once again to make sure it follows the sugar workflow.

I also intend to work on a few issues during this time, mostly those that could help me with executing my project. Aside from helping out Sugar Labs in general, I've also found this to be helpful for me to get familiar with the coding style used in Sugar Labs project and in production-ready code in general. It gives me an opportunity to make sure I am familiar with concepts relating to code modularity which are crucial in carrying out this project.

Coding Period

Week 1-2 (May 27 - June 9)

- Begin working on the **Game of Nim**. During the first week, research all the game rules, write all the core logic and create the user interface using pygame. Build a working sugar activity with all the necessary features required.

- During the second week, focus on testing and fixing any bugs in the activity. Implement all feedback from the mentors and focus on enhancing the user experience of the activity by improving visuals and adding engaging features such as music/tutorial/etc. Write all the documentation required for the activity.

Week 3-4 (June 10 - June 23)

- Begin working on the **Number Guessing game**. Write all the core functionalities and utility functions in the first week. Create a working activity and gather feedback from the mentors.

- Implement all the feedback from the mentors, thoroughly test the activity, fix bugs and add enhancements to the game such as better visuals, etc. Conduct final testing and write all documentation required for the activity.

Week 5-6 (June 24 - July 7)

- Begin working on the **Fish Soup game**. During the first week, research game mechanics and develop core game logic for player input, word selection, and checking for common letters in the game. Get the activity close to completion. Gather feedback from the mentors.

- Iterate on the project based on all the feedback from the mentors, thoroughly test the activity, fix bugs and add enhancements and extra features. Conduct final testing and write all documentation required.

Midterm Evaluation (July 8)

Game of nim, Number Guessing game and Fish soup game should be ready with all the features. The work so far should ensure this is implemented in time for the Midterm evaluation submission period.

Week 7-8 (July 8 - July 21)

- Begin working on the **Goat, Cabbage and wolf game**. During the first week, research game mechanics, develop core game logic for player input, moving objects (goat, cabbage, wolf), and checking for valid moves. Get the activity close to completion. Gather feedback from the mentors.

- Iterate on the project based on all the feedback from the mentors, add variations to the activity. thoroughly test the activity, fix bugs and add enhancements and extra features.

Week 9-10 (July 22 - August 4)

- Begin working on the **3 utilities game**. During the first week, research game mechanics, Develop the core game logic for player input, utility placement, and checking for win conditions. Get the activity close to completion. Gather feedback from the mentors.

- Implement mentor feedback, Add more difficulty levels to the activity, thoroughly test the activity, fix bugs and add enhancements and extra features. Conduct final testing and write all documentation required.

Week 11-12 (July 22 - August 4)

- Begin working on the **Latin Squares game**. During the first week, research game mechanics, Develop the core game logic for generating and presenting Latin Squares. Implement varying difficulty levels in the game. Get the activity close to completion. Gather feedback from the mentors.

- Taking mentor feedback into consideration, implement whatever is required inthe activity, thoroughly test it, fix bugs and add enhancements and extra features. Conduct final testing and write all documentation required.

Week 13-14 (August 5 - August 18)

- A buffer period - leaving room for new unforeseen tasks that come up along the way. Work on any tasks that are yet to be finished.
- If all tasks are complete, add any additional features which could be beneficial.

Final Evaluation (August 19)

Deliverables:

6 fully functioning sugar activities, complete with engaging visuals, sounds and all the above mentioned features along with all the testing and documentation required. I will try to make the code for all the activities as modular as possible such that there will be a lot of future scope to build upon these activities.

Availability:

I will be having exams from 10-21 May during the community bonding period. After these exams, The university would be off for summer holidays. I will not be having any other commitments to attend to during the time which makes me available to work throughout the duration of the GSoC timeline.