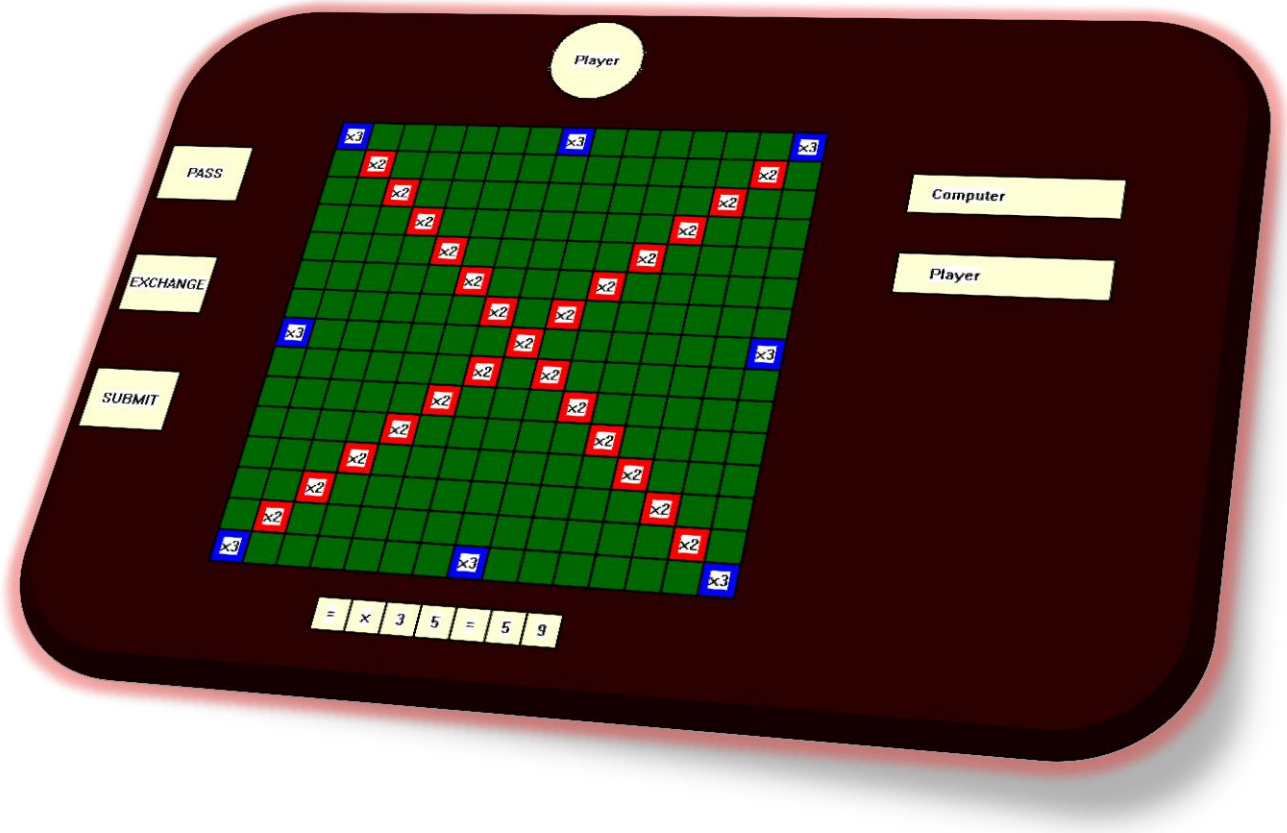
Software Project Report

CS101 Project 2015

Mathematics Scrabble

Group 407



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Introduction

We play many games for entertainment purpose in day to day life. In order to make learning process interesting and developing our minds intellectually we can add some educational value to make these games more productive.

One such game can be Mathematics or Number Scrabble. We are already familiar with the popular board game of Word scrabble. Another exciting format of this board game exists in the form Mathematics Scrabble.

The game is meant for the young developing minds, mainly consisting of school students.

So, in order to provide the users with a nice and entertaining yet educational game and to popularize it, we decided on developing the fun game of Maths Scrabble.

About the game

"Number Scrabble" (or "Math Scrabble") is a game based on normal Scrabble, but here we make equations instead of words. The letter tiles used in Scrabble are replaced with numbers and operators.

- *In this board game players are provided with a specific number of random tiles from a specified set of tiles.*
- *The player is supposed to build up a valid Mathematical Equation and present in on board to gain score.*
- *He can pass or exchange and pass at his will, if he thinks no possible equation can be set up.*
- *Ultimately, when set of all tiles is exhausted, the player with maximum score wins.*

Modifications

The version of the game we are making will be a single player game, where the opponent is the computer. This is done because the game demands that players do not see the tiles allotted to the other players.

Scoring

- *Basic scoring is the sum value of values of all tiles used.*
- *Double-tile(x2) and triple-tile(x3) multiply the value of the tile placed by 2 and 3 respectively.*
- *The value and number of tiles are as follows:*

Tile	Value	Quantity
'0'	1	5
'1'	1	10
'2'	1	8
'3'	1	8
'4'	1	8
'5'	1	8
'6'	2	8
'7'	2	8
'8'	2	6
'9'	2	5
'+'	1	8
'-'	2	6
'x'	3	7
'÷'	5	8
'='	0	16

Problem Statement

The aim of the project is to build a software version of the game with basic user interface.

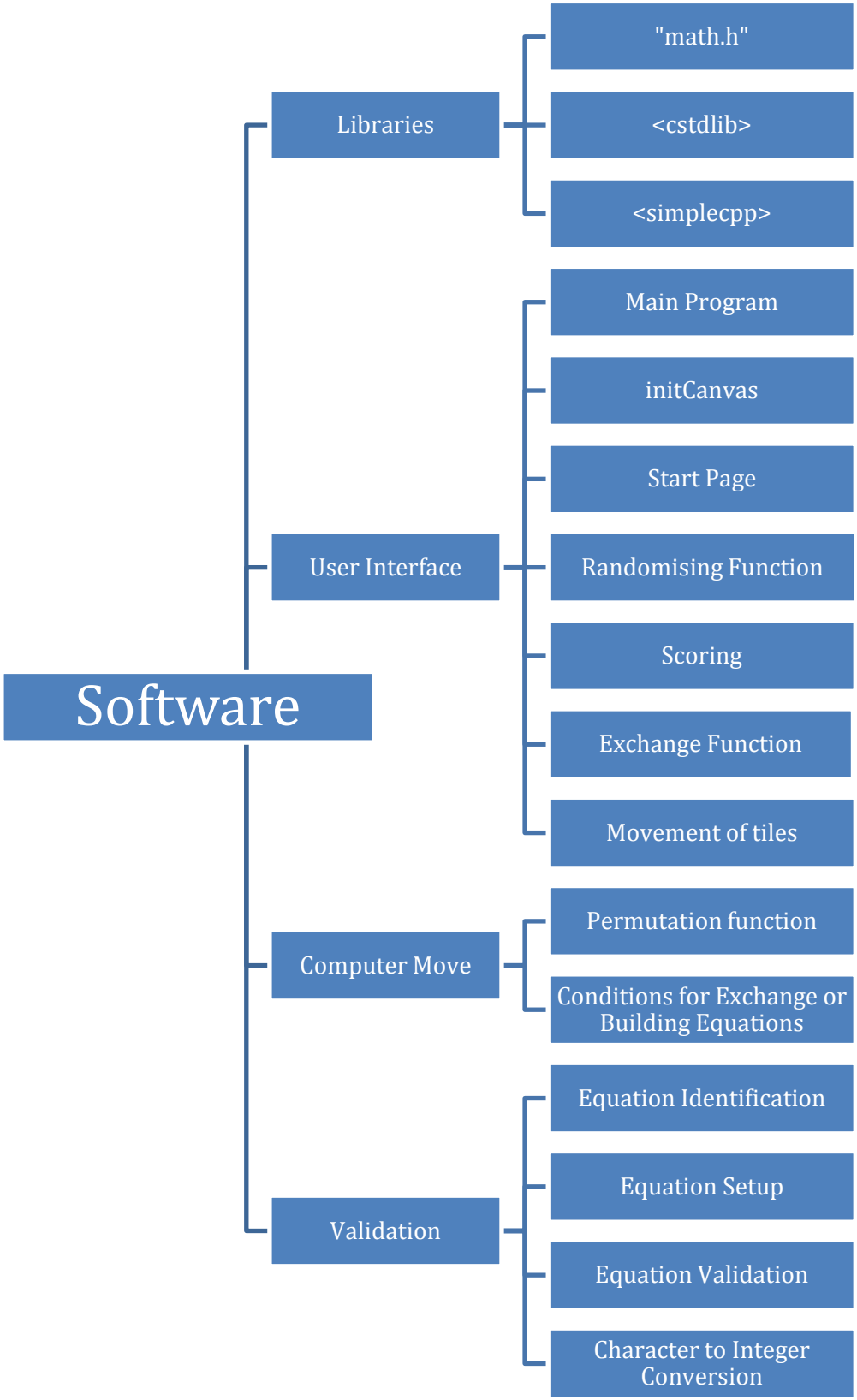
Goals of the Project

- *A randomising function that distributes random tiles to players.*
- *To build a set of functions which will identify as well as verify the equation built on the board.*
- *Building a permutation function that will enable the computer to build equations on its own. This is required because the player plays against the computer.*
- *Building a scoring function which can award score based on the laid rules of scoring.*
- *Providing decent graphics for smooth gameplay.*

Implementation

- *The game starts with random distribution of the tiles.*
- *The player is given the first turn. Player can build equation starting from the centre of the board, pass or exchange and pass.*
- *As soon as the player submits the equation, it is validated. If correct, appropriate score is awarded and game continues to the computer. If incorrect, then the tiles are returned to the player.*
- *The next turn goes to computer, which uses the permutation and validation functions to build a proper equation.*
- *The computer submits and so the game continues.*

Software Architecture



Challenges and their Solutions

Challenges	*Description*	*Solution*
type of Array	*Since the game involved usage of operators as well as integers. We couldn't use 'int' or 'float'*	*We decided on using 'char' type. This incorporated all integers and operators as well as used less memory space.*
Building up Equations from 'char'	*The new equations were to be identified and built. Now building equations out of char was difficult. More than one digit numbers were to be treated specially as their digits were stored in different memory space.*	*We came up with functions like 'char_to_int' and number building functions. These functions now prove to be basic needs for the code to run.*
Gaining efficiency in computer's turn	*Earlier the Computer turn was taking a lot of time to give any output. This caused a slow gameplay.*	*We figured out some special cases that could be removed and developed a lighter version of the permutation function to make it more effective as well as efficient.*
Special Cases	*As soon as computer's part was integrated, we came to know that a lot of special cases need to be removed for better gaming experience.*	*This problem was removed by rigorous debugging sessions and slight modifications in the basic code.*

Requirements

- *A Windows PC*
- *Code::Blocks IDE (with Simplecpp Library)*
- *Hardware: Pointing device*

Constraints

The constraints posed are:

- *Availability of software to support the execution of the program. The program will need a C++ compiler for its functioning.*
- *We have assumed that the user has a basic knowledge of Mathematics. Also the user is assumed to be able to operate the computer device and peripherals.*
- *Due to limited time the user interface developed is basic.*
- *It is assumed that largest size equation gives maximum score and hence the AI always tries to form largest possible equation. However the AI works first in horizontal then in vertical direction so wherever it gets first valid equation, that equation is built.*

Future Work

- *The game can be developed with better graphics for interactive educational purposes. This software can then be used in schools or with kids of age < 10.*
- *Multiplayer version of the game using LAN connections can be built so two players can play the game simultaneously. This will requires access to LAN.*
- *Including other mathematical operators like square root, square etc. This will add fun to the game. Also this game can be launched on an open platform.*

Bugs

The goals set were achieved in time and a complete game has been developed. However some unidentified problems may still persist. We have tried our best to make the game bug-free but time-constraint might have caused some problems to be overlooked.

Instructions

Installation Instructions:

1. *Open Internet Browser on your PC.*
2. *Goto: http://cse.iitb.ac.in/~ranade/simplecpp/*
3. *Download the "Full Version".*
4. *Install the software using the setup and help video (URL provided above).*

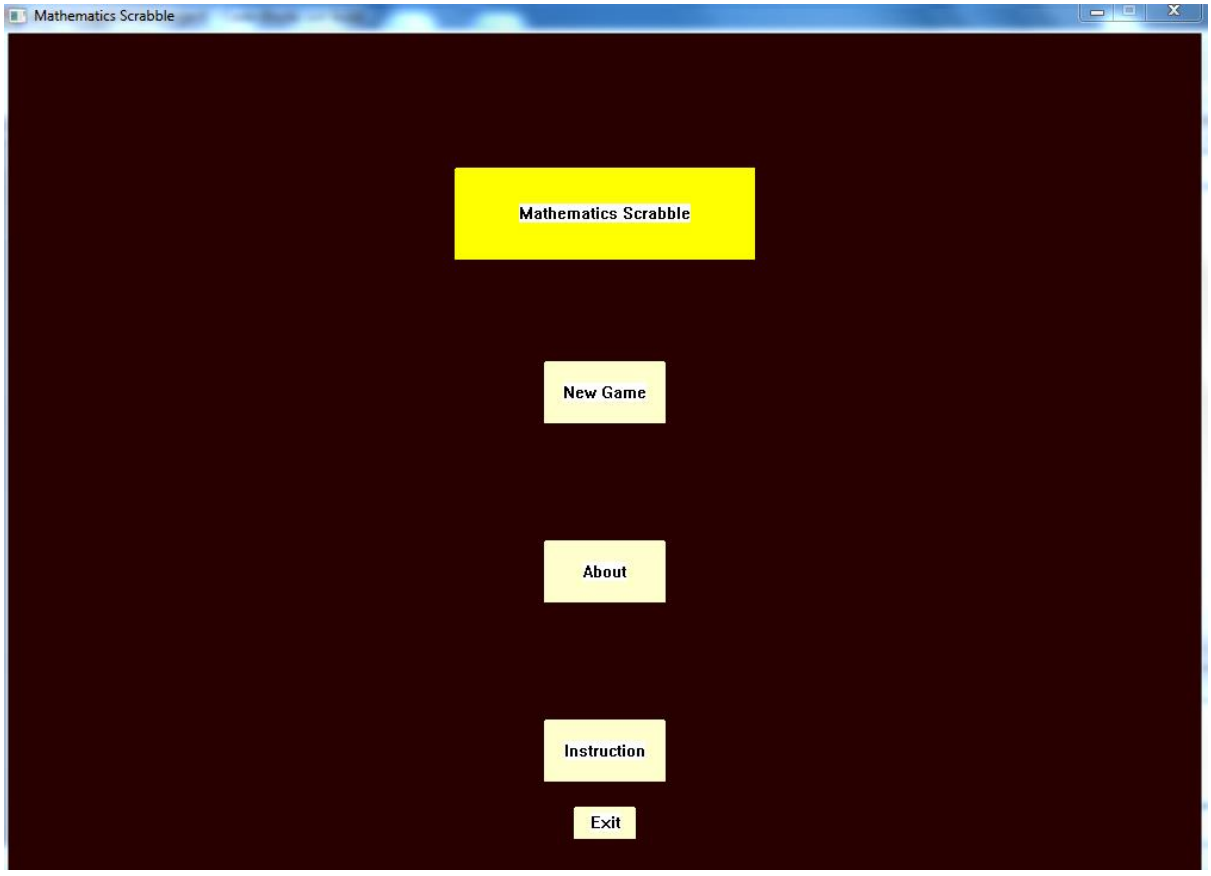
Running the program on CODE::BLOCKS(Simplecpp):

1. *Open the Code::Blocks application.*
2. *Once the application is running, click on "Open an Existing Project".*
3. *Select the "project file" from the folder.*
4. *Once the project is loaded, Build and run the code.*
5. *A terminal and a game window will open.*
6. *Click on "Start" to Start the game.*
7. *You can "Submit" after building your equation.*
8. *Or there are options for "PASS" and "EXCHANGE" as well.*

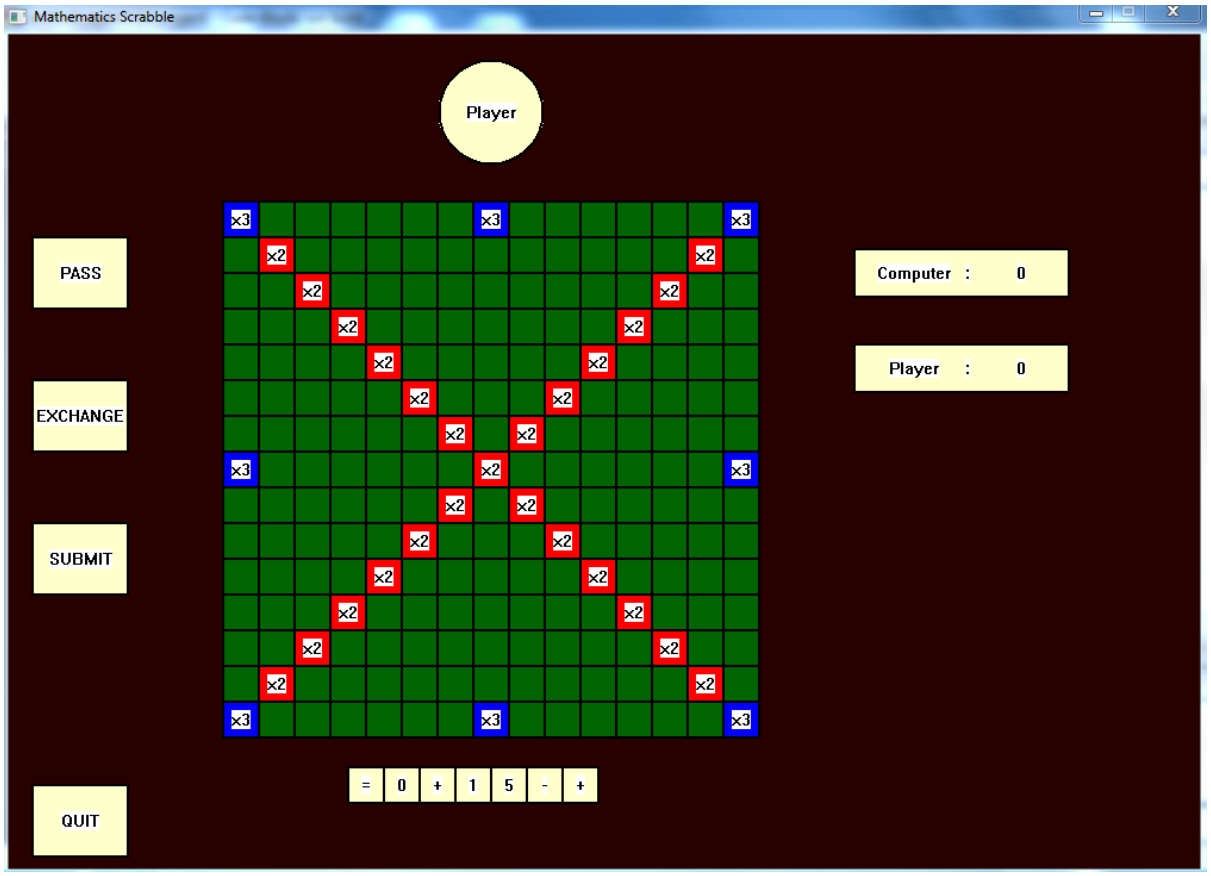
Screenshots and Video

- ***Video URL: https://youtu.be/dFLBImlgG7I***

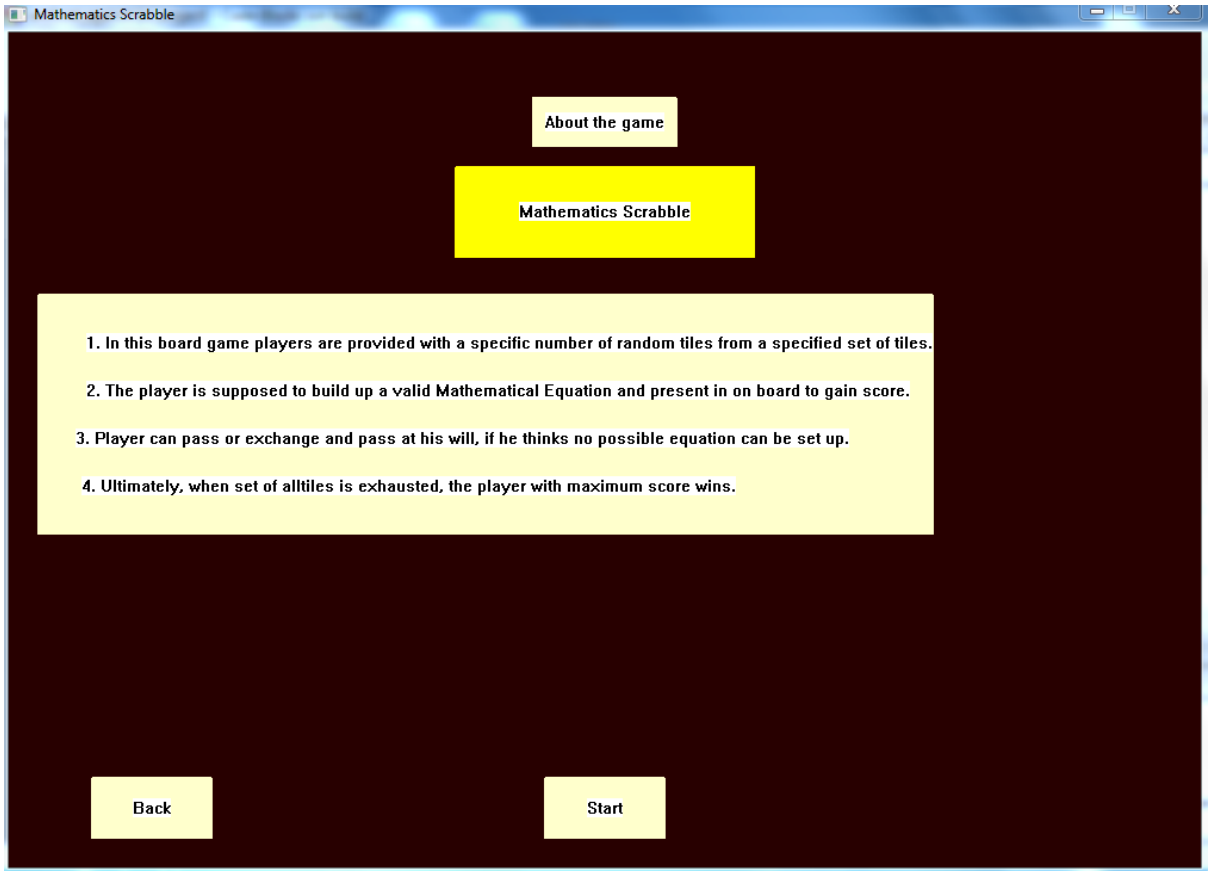
- ***Start Page:***



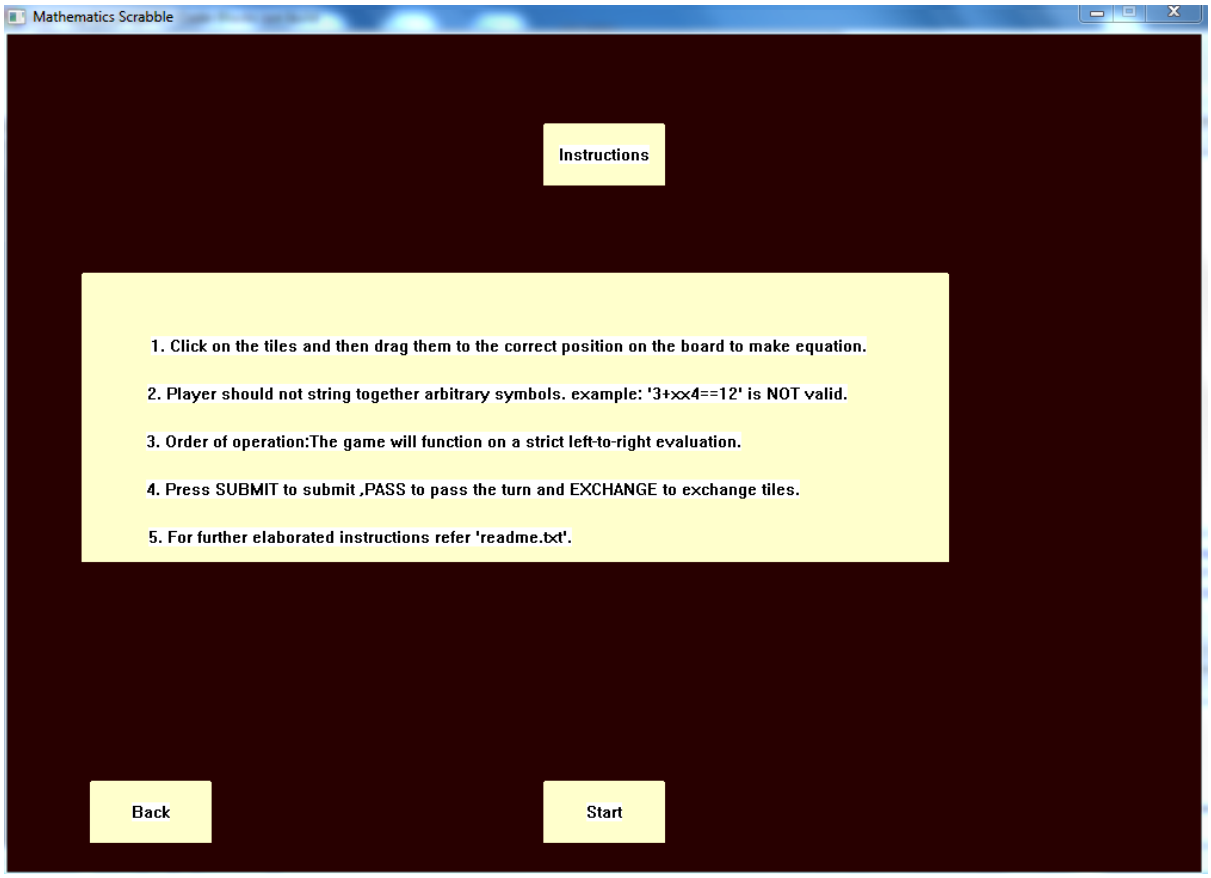
- ***Gaming Window:***



- ***About:***


Mathematics Scrabble
About the game
Mathematics Scrabble
1. In this board game players are provided with a specific number of random tiles from a specified set of tiles.
2. The player is supposed to build up a valid Mathematical Equation and present in on board to gain score.
3. Player can pass or exchange and pass at his will, if he thinks no possible equation can be set up.
4. Ultimately, when set of alltiles is exhausted, the player with maximum score wins.
Back
Start

- ***Instructions:***



References

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3. *http://www.instructables.com/id/Number-Scrabble-The-Game-aka-Math-Scrabble/*
4. *http://moodle.iitb.ac.in/*