

## Designing Video Game for Cognitive Development in Dyslexic People

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### Abstract

Psychologists and neuroscientists are using new techniques to identify the source of language and reading problems such as dyslexia in the brain and create neural processing exercises disguised as computer video games to significantly improve children's language learning and reading. Dyslexic children trained on action/activity video games show significant improvements on basic measures of both attention and reading ability, suggesting future directions for the study of dyslexia intervention paradigms. The A "MAZE" ING BALL GAME, which is being proposed here, is a maze game in which the player has to take the ball to the finish position in keystrokes less than 350 and the player also has to take care of maze wall because if the ball hits the maze wall, the player has no chance to move the ball further and the game will get over. The game is designed in Core java and with Multithreading, Packages, Swings & AWT (for GUI), Event Handling, JDBC etc. The main IDE used for the designing of the game is NETBEANS 7.0.1 and for database connectivity Microsoft SQL Server 2008 (64 bit) is used. This game has been designed in two levels with increasing difficulty to gauge the improvements in the subjects. The higher level is designed more challenging for the player so that a considerable amount of concentration power is needed to complete the game successfully. It is expected that this game will enhance the subjects' motor skills and subsequently on other tests measuring attention span. It could provide a new, fast, fun remediation of dyslexia. The test results will be very important in order to understand the brain mechanisms underlying dyslexia but as of now these won't put us in a position to recommend playing video games without any control or supervision.

**Keywords:** maze game, JDBC, dyslexia, Core java, motor skills

## 1. Introduction

The A “MAZE” ING BALL GAME is a maze game in which the player has to take the ball to the finish position in keystrokes less than 350 and the player also has to take care of maze wall because if the ball hits the maze wall, the player has no chance to move the ball further and the game will get over. The game is designed in java and various java programming features has been used in this like Multithreading, Packages, Swings & AWT (for GUI), Event Handling, JDBC etc. The main IDE used for the designing of the game is NETBEANS 7.0.1 and for database connectivity Microsoft SQL (64 bit) is used. This game is designed to appeal children of various age groups. This is a fun game with some new and different rules as compared to other traditional maze games. Going further in this, I wanted this game to be more challenging for the player so that a considerable amount of concentration power is needed to complete the game successfully. Psychologists and neuroscientists are using new techniques to identify the source of language and reading problems such as dyslexia in the brain and create neural processing exercises disguised as computer video games to significantly improve children's language learning and reading. Dyslexia is a language-based learning disability and is often severe enough to make it difficult for children to succeed academically. <sup>[1], [2], [3]</sup> Treatment for language and reading impairments by speech therapists and reading specialists is often a slow, long, expensive and frustrating experience for professionals, parents and children. A groundbreaking 2003 study using functional MRIs by Elise Temple, PhD, John Gabrieli, PhD, Dr. Tallal and other colleagues showed changes in brain function in children with dyslexia after using the computer program. <sup>[4], [5]</sup> The study found increased activation in multiple brain regions during phonological processing, as well as significantly improved language and reading. <sup>[6]</sup>

## 2. Discussions: The Game Design

### 2.1) Project Modules:

**2.1.1) TEST3.JAVA:** This class designs the opening page of the game. This class has three buttons for “New Game”, “Indiviudal Best” and “Exit”. This class uses thread to move a string “Ball Maze” throughout the frame in a zig-zag manner.

**2.1.2) OPL.JAVA:** This class defines the frame where the player has to enter his/her name and submit to enter the playing frame. This class's frame activates when we press “New Game” button in test3.java. It has two buttons for “Submit” and “Back”, a textfield and a label.

**2.1.3) HIGH.JAVA:** This class shows the player's name, score, keystrokes and result who have won the game and having the highest score. It defines labels and buttons for “OK” and “Clear Record”. This frame activates when we click on “Individual Best” in test3.java.

**2.1.4) MYGRAPHICS.JAVA:** This class defines the main working of game. It consists of an array of 58 rectangles which combine to form the whole maze and another rectangle object to form the ball. It uses thread to identify any sort of collision between the ball and the maze wall. The motion of the ball can be controlled by the user through direction/arrow keys.

**2.1.5) DBINS.JAVA:** This class connects our project to the database (MYSQL) for inserting the player's information like player's name, score, key strokes and result.

## 2.2) Rules of the Game:

**2.2.1)** The player is not allowed to hit the maze wall, if the ball hits the maze wall player won't get any chance to continue the game and the game will get OVER.

**2.2.2)** The player has to reach the finish position in keystrokes less than 350.

**2.2.3)** The player will be awarded with different scores on different arrow key pressed as following:

- LEFT arrow key – +12 to the current score
- RIGHT arrow key – +8 to the current score
- UP arrow key – +4 to the current score
- DOWN arrow key - +16 to the current score

**2.2.4)** When a child masters the task, the game adjusts its playing level so the child is challenged on a more advanced level. All this can be monitored via the Internet by a medical professional to gauge the improvements in the dyslexic child. The home opening page and level 1 and 2 of the game are shown in Figure1, 2 and 3

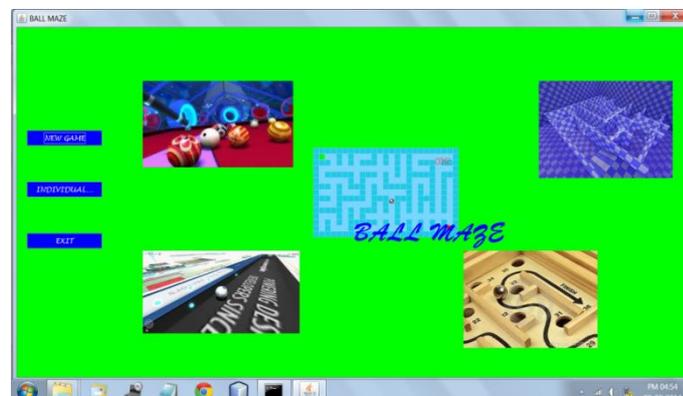
## 2.3) Hardware and Software Requirements:

### 2.3.1) Software Requirements

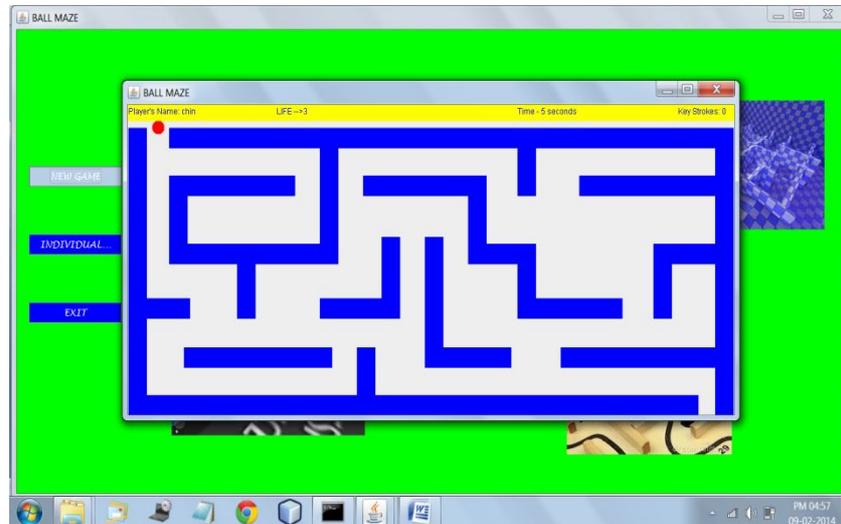
- SQL SERVER 2008
- NETBEANS IDE
- JDBC DRIVER

### 2.3.2) Hardware Requirements

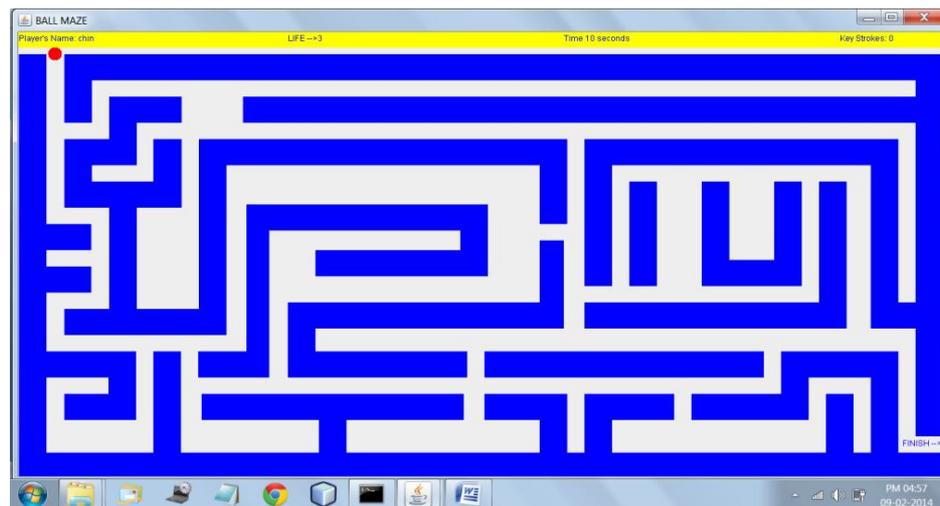
- Processor type: Pentium III-compatible processor or faster
- Processor speed: Minimum: 1.0 GHz, Recommended: 2.0 GHz or faster
- RAM: Minimum: 1 GB (Recommended: 2.048 GB or more)
- Maximum: Operating system maximum
- Minimum 250 GB available hard disk space
- Operating System – Windows XP/7/8



**Figure 1:** The Home start up view of the game



**Figure 2.** Level 1 of the A “MAZE” ING BALL GAME



**Figure 3.** Level 2 of the A “MAZE” ING BALL GAME

### 3. Conclusions

The Present game can be further developed to device neuroplasticity-based computerized video games that can "rewire" the brains of children with this form of dyslexia and activate those areas of the brain critical to reading skills. With intensive remedial training, their brains begin to function more like those of normal readers. This application of psychological knowledge and new neuroscience-based learning methods blended with new technology of video gaming can result in improving the motor movements, reflexes and learning capacities of the dyslexic children

#### **4. Recommendations for Development of the Game**

4.1) The game could include various levels each with a different maze and with increasing level of difficulties.

4.2) Player could be given some time constraints beyond which the game will get over and player has to restart the game.

4.3) Rather making it a single player game, it could be designed for multiple player where two or three player can compete simultaneously to place there ball at the finish position before the other two players.

4.4) The game could have been designed to let people play it online and maintain a universal database for the game in which information about every player around the world is stored.

#### **References**

- [1] Holly Fitch, R., & Tallal, P. (2003). Neural mechanisms of language-based learning impairments: Insights from human populations and animal models. *Behavior and Cognitive Neuroscience Reviews*, Vol. 2, pp. 155-178.
- [2] Tallal, P., & Benasich, A. A. (2002). Developmental language learning impairments. *Development and Psychopathology*, Vol. 14, pp. 559-579.
- [3] Temple, E., Deutsch, G.K., Poldrack, R.A., Miller, S.L., Tallal, P., Merzenich, M.M. & Gabrieli, J. (2003). Neural deficits in children with dyslexia ameliorated by behavioral remediation: Evidence from functional MRI. *Proceedings of the National Academy of Sciences*, Vol. 100, pp. 2860-2865.
- [4] Sandro Franceschini et al. (2013) Action Video Games Make Dyslexic Children Read Better, *Current Biology*, Volume 23, Issue 6, pp 462–466
- [5] D. Bavelier et al (2013) Cognitive Development: Gaming Your Way out of Dyslexia? *Current Biology*, Volume 23, Issue 7, pp R282–R283
- [6] Filippos Vlachos et al. (2013) Brain hemisphericity and developmental dyslexia, *Research in Developmental Disabilities* Volume 34, Issue 5, May 2013, pp 1536–1540

