

Simon Says Memory Game

Background:

There are several different types of memory: "Working memory" processes information over a span of about 15 seconds, "short-term memory" retains information for up to about 60 seconds and "long-term memory" stores information indefinitely. Sustained practice with memory games has been shown to strengthen memory functions. There is ample research and science on how to improve cognitive memory skills. There are also several methods and techniques for structuring games to improve memory retention, regardless of age.

From Wikipedia¹:

Working memory is the system that actively holds multiple pieces of transitory information in the mind, where they can be manipulated. This involves execution of verbal and nonverbal tasks—such as reasoning and comprehension—and makes them available for further information-processing. It is not the same as short term memory. Working memory tasks require monitoring (i.e., manipulation of information or behaviors) as part of completing goal-directed actions in the setting of interfering processes and distractions. The cognitive processes needed to achieve this include the executive and attention control of short-term memory, which permit interim integration, processing, disposal, and retrieval of information. These processes are sensitive to age: working memory is associated with cognitive development, and research shows that its capacity tends to decline with old age. Working memory is a theoretical concept central both to cognitive psychology and neuroscience. In addition, neurological studies demonstrate a link between working memory and learning and attention.

Theories exist both regarding the theoretical structure of working memory and the role of specific parts of the brain involved in working memory. Research identifies the frontal cortex, parietal cortex, anterior cingulate, and parts of the basal ganglia as crucial. The neural basis of working memory has been derived from lesion experiments in animals and functional imaging upon humans.

There are several forms of memory games and lots of web resources that have such games:

- <http://www.primarygames.com/puzzles/memory.php>
- <http://www.mathsisfun.com/games/memory/index.html>
- <http://pbskids.org/games/memory.html>

Your development team will implement a Simon Says style memory game.

<http://www.brainmetrix.com/memory-test/> is good comparative example of what your final application should look like.

¹ http://en.wikipedia.org/wiki/Working_memory

Application Problem Description:

Simon Says allows players to play memory games based on repetitive sequences of activated objects. Every player will have a unique alpha-numeric username (maximum of 12 characters) to identify themselves and track their scores. When the game starts, a list of top 5 high scores will be displayed and the player will have the ability to login with an existing username or create a new username. A high scores list will be used to display the top 5 high scores. Once the player identifies or creates a username and logs in, the player will be allowed to play the memory game. No password is required in the initial version of the game. A score is composed of a number of objects, longest correct sequence, and time (recorded in minutes, seconds, and milliseconds). High scores are based on the highest number of objects, then the highest number of sequences, then the lowest time.

This is a *conceptual* notion of how a player would be introduced to the game.

Simon Says

Please enter username to begin:

Login

Don't have a username?

Create New User

High Scores

User	Sequences	Time	Objects
1. drago246	15	00:35:12	10
2. drago246	15	00:34:59	10
3. REEVER	15	00:33:20	9
4. hootowl	10	01:12:43	8
5. dodger1	9	02:14:26	8

How to setup a game: A “Simon Says” style game will be presented to the user. The game is based upon a series of objects, which can range from some minimum number (4) to some maximum number (25). The objects can have a different shape (circle, square, triangle), size (small, medium, large), color (red, blue, green, purple, orange, yellow), or layout, which is the location of objects relative to each other (grid or diamond).

A memory game consists of a score and a collection of objects that have a particular shape, size, color, and layout. Before playing each memory game, the player can choose any of these options. The player should always be able to “log out” and choose a different user.

This is a *conceptual* notion of how a player would set game options and begin a game:

Simon Says

Username:

maxpawn59

Logout

Play!

Game Options

Number of Objects:

▽ 5

Shapes:

<input checked="" type="checkbox"/>	Square
<input checked="" type="checkbox"/>	Triangle
<input type="checkbox"/>	Circle

Colors:

<input checked="" type="checkbox"/>	Red
<input type="checkbox"/>	Blue
<input type="checkbox"/>	Green
<input type="checkbox"/>	Purple
<input type="checkbox"/>	Orange
<input type="checkbox"/>	Yellow

Layout:

<input checked="" type="radio"/>	Grid
<input type="radio"/>	Diamond

Object Size:

▽ Medium

Playing a Game: Once a game begins, the player is presented with a number of objects in a particular layout. A timer starts which ends when the player makes a wrong matching sequence, thus ending the game.

Objects are either in an activated state or an unactivated state. A sequence is defined as an ordered activation of one or more objects. A sequence involves an activation of objects, which should be visually indicated to the player. A game is defined as a number of rounds: each round consists of a computer generated sequence, followed by a player generated sequence. If the computer and human sequences match, game play progresses to the next round. As each round progresses, the number of objects in a sequence increases by 1 and the sequence is incrementally constant. The game ends when the player does not correctly match the computer generated sequence: the time, number of objects, and length of the correct sequence is recorded for the player when the game ends. If the score is in the top 5 for all players, it appears in the top 5 scores list.

Layouts: A layout is an arrangement of objects. Objects may be arranged either in a grid or a diamond. A grid layout arranges objects in a table of rows and columns whereas the diamond shape arranges them based on the lines of a diamond. Grids should be arranged so that the number columns and rows are equal.

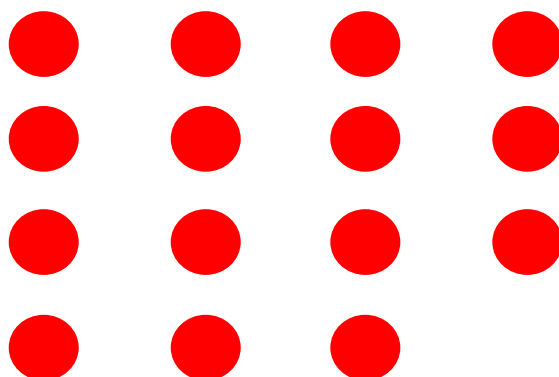
2x2 Grids: 4 objects

3x3 Grids: 5-9 objects

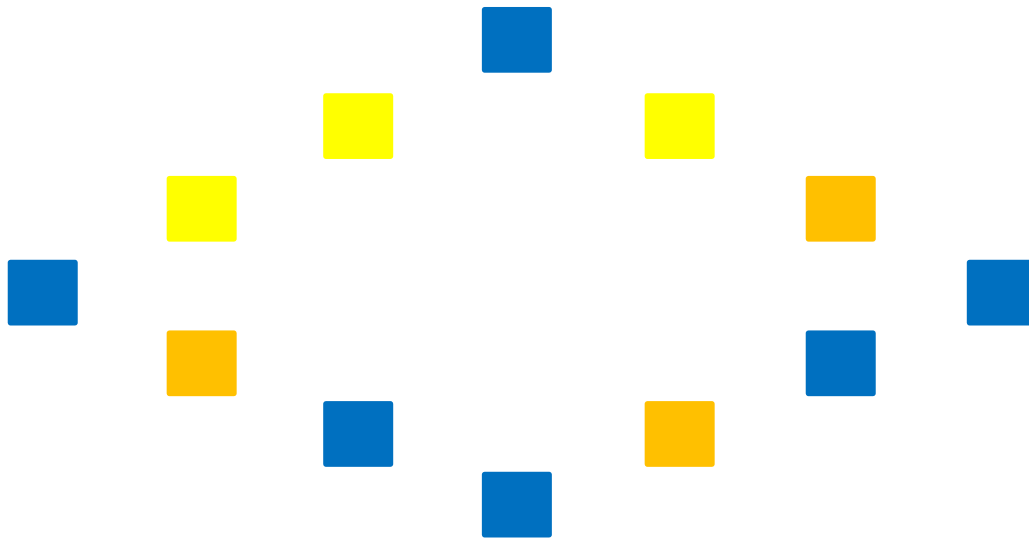
4x4 Grids: 10-16 objects

5x5 Grids: 17-25 objects

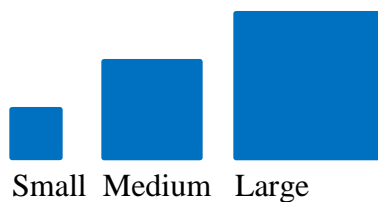
Conceptual grid layout of 15 objects with circle objects with single color of red:



Conceptual diamond layout of 12 square objects with colors or blue, yellow, and orange:



Size: The game should support 3 different sizes for any given object shape: small, medium, large. This a *conceptual* example of varying sizes:



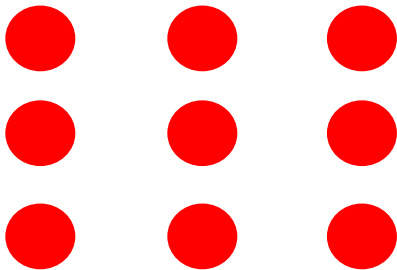
Activation: Activation is a visual indicator to the player that an object is “active” as part of a sequence. There are different ways an activation might be indicated and some ideas include: 1) using a border around an object; 2) using a lighter color for unactivated and a darker color for activated; 3) changing the color of the object to black or white (or some pattern); 4) some combination of these. It does not matter what method of activation is used, as long as the player can clearly distinguish activated from unactivated. An object should remain activated for 1-2 seconds and then return to an unactivated state. The time between activated objects should be around 2-3 seconds.

The computer can activate an object as part of a sequence. The player should also be able to activate a sequence using appropriate interfaces (keyboard, mouse, touch, etc.).

A sample game play: the following illustrates a conceptual game which is a sequence of rounds, where each round is a computer generated sequence, followed by a human generated sequence.

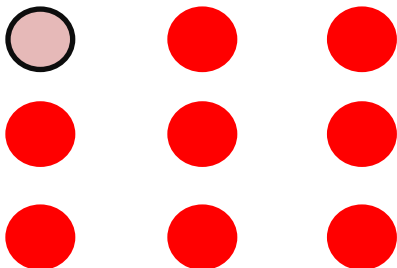
Starting configuration:

Layout = Grid, Objects = 9, Size = Medium, Colors = Red, Shapes = Circle

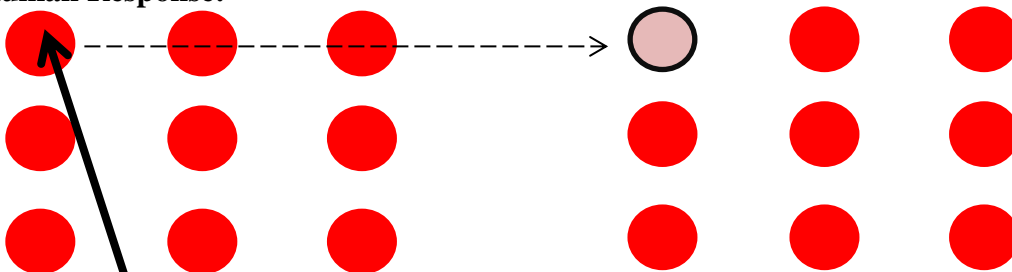


Round 1: Sequence Length = 1

Computer:



Human Response:

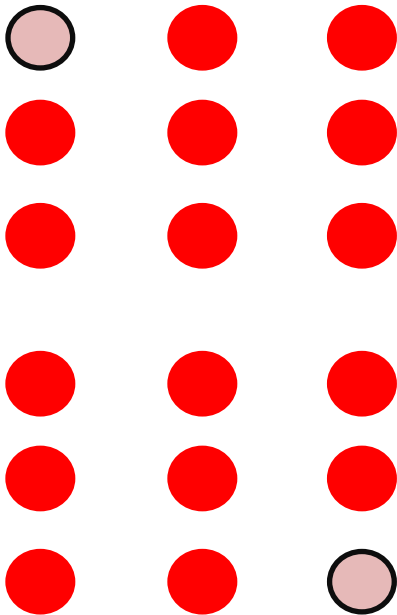


MOUSE CLICK causes activation

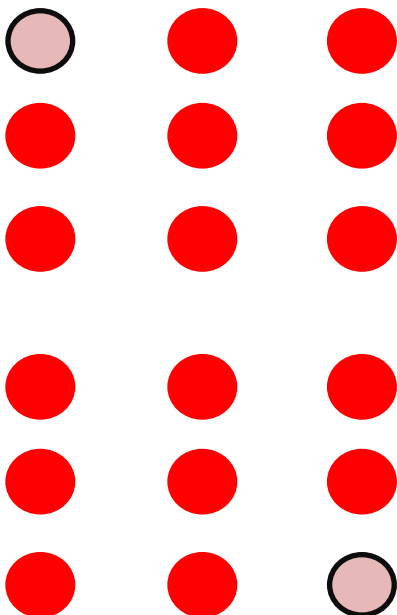
CORRECT Human Response: Go to Round 2

Round 2: Sequence Length = 2

Computer



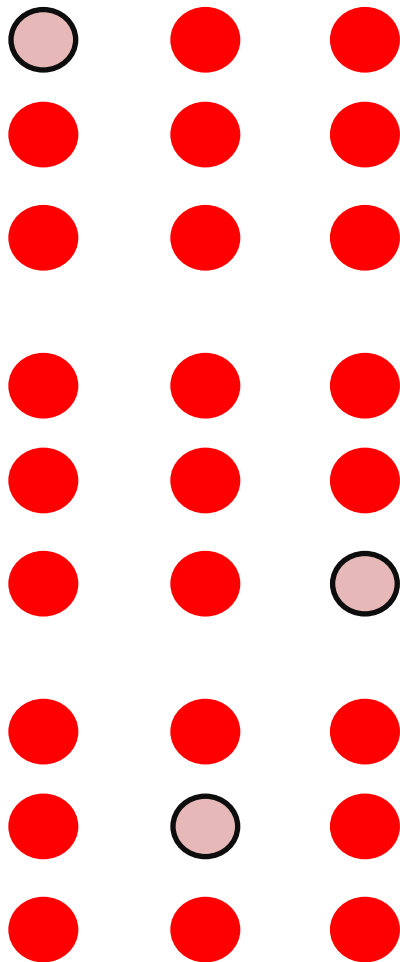
Human Response:



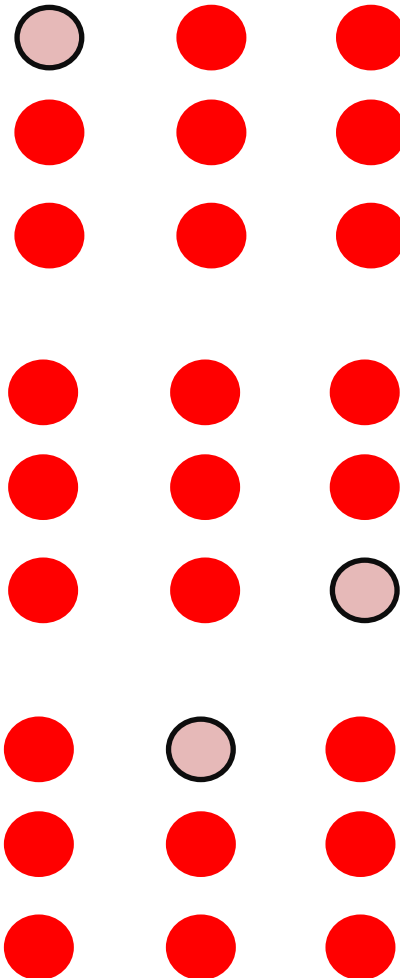
CORRECT Human Response: Go to Round 3

Round 3: Sequence Length = 3

Computer



Human Response



INCORRECT Response:

Game ends: Time at the end of game, # of sequences (correct) = 2, and 9 objects are recorded as the score

When a game ends, the player should be allowed to configure game options and play again.

Technical Requirements:

The major technical requirements for the application involve the deployment environment. The customer requires the game to run on an **Android application environment** and run as a **Java web applet**.