Dengue Awareness Game

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Abstract

Dengue is a viral disease mostly spread by Mosquitos. The information about dengue is available in literature and also in visual form but unfortunately people don't have habit to read the literature and to learn from it.

The purpose of this project is to collect information about dengue and to make a game after organizing this information and give people an interesting way to learn about dengue.

The information of dengue is divided into three parts; Awareness, Prevention and Curing. Part first i.e. Awareness part has information about how dengue spreads, how to prevent it and how to cure a person if he/she suffers from dengue. Other two parts i.e. Prevention and Curing are the test of the player about all the knowledge he/she gets from the first part i.e. Awareness.

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1   Introduction to the Project

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1.1 Motivation

First registered case of dengue was in 2006 in Karachi. During recent past year from 2010 to 2014 there were over 17,000 registered cases of dengue and 257 deaths in Lahore only and over 5000 registered cases in other parts of Pakistan. The main motivation behind this project is to develop a game to aware people about dengue as well as prevent it.

1.2 Objective

The major objective of developing this game is to teach people about dengue virus. Although there is literature available about dengue virus but unfortunately people don't have habit to read the literature and to learn from it. This game will give people an interesting way to learn about the dengue virus.

1.3 Related Work

There are many games available about dengue on android market but these games are not fulfilling the requirement of the context of the project defined. These are totally useless games having no element of fun as well as learning. The ideas used in these games are irritating and people don't take any interest in playing these games because they don't provide any necessary education.

1.3.1 Available games

There are many games available on android market related to dengue. Some of them are as follow.

- Xo Dengue!
- Smash Dengue

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1.3.2   Main drawbacks/deficiencies

Xo dengue is a game with multiple mosquitoes on the screen and player has to kill them one by one. There is no such factor of learning in the game. Also there is no information about the dengue virus, the symptoms of dengue fever and how to prevent it or how to cure a person affected by dengue.

Smash dengue is the game in which Player has to smash the mosquito whenever it is near to the person on the screen. The main drawback of smash dengue is same as of Xo Dengue. It is also an irritating game providing no information about the dengue.

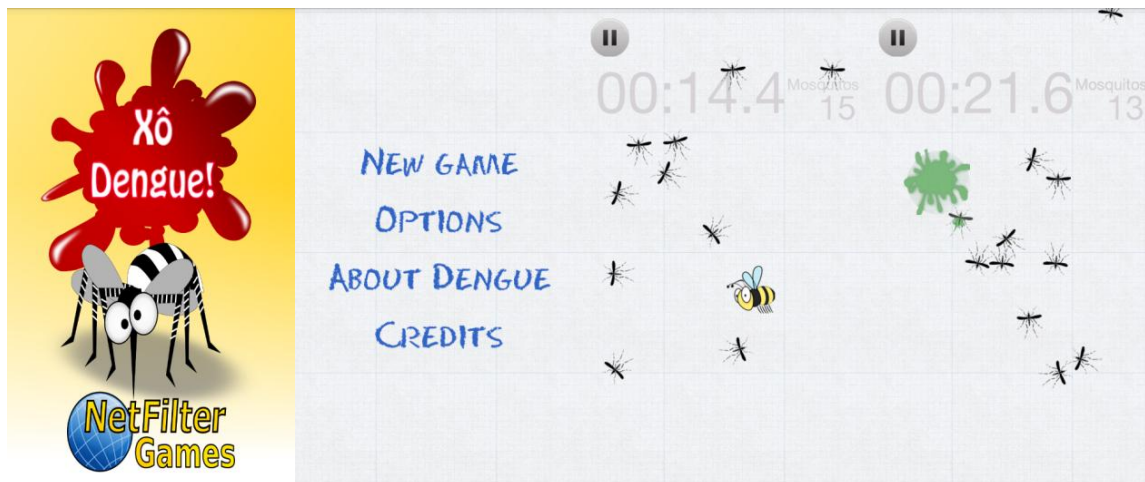The screen shot of the already available games are as follow:

Figure 1-1 Xo Dengue [9]

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Figure 1-2 Smash Dengue [8]

1.4 Game Strategy

The information about the dengue is divided in to three parts. Each part is designed as the world of game such as awareness, prevention and curing. The details of these worlds are as follow:

1.4.1 Awareness World

In this part the information about the dengue is provided to the Player. Such as how dengue virus spreads, time in which dengue is active, what are the symptoms of dengue fever and if a person is affected by fever then how to cure that person.

During the design of part I, I decided to collect multiple informative images about dengue then converted these images in to parts and made a puzzle of splitted images. Now when a player completes the puzzle he will get the information and objects which will be used for prevention and curing of dengue. So the Player can use these objects to complete levels of other two worlds.

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1.4.2   Prevention World

In this part Player will learn to prevent the dengue virus from spreading. Spray to kill mosquitoes, use mosquito repeller, cover the infected person, keep water pots or water tank covered, and drain rain water from the area.

In the design of this part player has specific area to prevent virus from spreading according to the information he/she gets from the information world such as removal of clean water from the area, apply insect killer in the area and cover the person that is already affected from dengue. This can be done by using the objects that player gets in the first world by completing the respective puzzle. If the objects are not available then player has to play the awareness world to get these objects.

1.4.3   Cure World

As there is no proper vaccine available for the treatment of dengue all we do is to keep the person under observation, give some pain killers and regularly check the blood pressure of infected person.

In this part there is a patient who is suffering from dengue fever. Player has to cure the patient according to the information he/she gets from the information world and by using the tools and medicines which he/she unlocked from the information world. If the objects are not available then player has to play the first world to get these objects.

2 Software Requirement Specifications

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A Software requirements specification (SRS), a requirements specification for a software system, is a complete description of the behavior of a system to be developed and may include a set of use cases that describe interactions the users will have with the software. In addition it also contains non-functional requirements. Non-functional requirements impose constraints on the design or implementation (such as performance engineering requirements, quality standards, or design constraints).

The software requirements specification document enlists all necessary requirements that are required for the project development. [1]

2.1   Use Case Analysis

A use case analysis is the most common technique used to identify the requirements of a system. "The primary goals of a use case analysis are: designing a system from the user's perspective, communicating system behavior in the user's terms, and specifying all externally visible behaviors." [1]

2.2   Primary Actor

- Player

2.3   Use Cases

The requirements of the game related to stake holder are as follows:

- Select world
- Make moves
- View hint
- Shuffle the puzzle
- Find objects
- View toolbox

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- Place objects
- Cure patient

2.4 Use Case Description

The description of the use case of this project is as follow:

2.4.1 Select World

Primary Actor: Player

Preconditions: Player selects play button for playing the game.

Success Guarantee (Post conditions): Player has given access to the different levels of the world.

Main Success Scenario (or Basic Flow):

1. Player selects play game option.
2. Player has three different worlds to select by clicking then he can go inside the world to play different levels of game.

Extensions (or Alternative Flows): Nil

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2.4.2   Make Moves

Primary Actor: Player

Preconditions: Player is in the awareness world.

Success Guarantee (Post conditions): Block of the picture is moved properly.

Main Success Scenario (or Basic Flow):

1. Player selects the awareness world.
2. Player clicks the block of picture to move it at empty place.
3. Repeat step 2 to complete the puzzle.

Extensions (or Alternative Flows):

2. Player clicks block whose neighbor is not empty so the block is not moved.

2.4.3   View Hint

Primary Actor: Player

Preconditions: Player is in the awareness world.

Success Guarantee (Post conditions): Player successfully viewed the hint.

Main Success Scenario (or Basic Flow):

1. Player selects the awareness world.
2. Player clicks the hint button to view the hint.

Extensions (or Alternative Flows): Nil

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2.4.4   Shuffle the Puzzle

Primary Actor: Player

Preconditions: Player is in the awareness world.

Success Guarantee (Post conditions): Player successfully shuffles the puzzle.

Main Success Scenario (or Basic Flow):

1. Player selects the awareness world.
2. Player clicks the shuffle button to shuffle the puzzle.

Extensions (or Alternative Flows): Nil

2.4.5   Find the Objects

Primary Actor: Player

Preconditions: Player is in the awareness world.

Success Guarantee (Post conditions): Player successfully finds the object he/she wants.

Main Success Scenario (or Basic Flow):

1. Player selects the awareness world.
2. Player moves the piece of the picture to complete the object.
3. Repeat step 2 until the puzzle is complete.

Extensions (or Alternative Flows):

2. Player selects the picture which is not moveable.

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2.4.6   View Toolbox

Primary Actor: Player

Preconditions: Player has started the game already.

Success Guarantee (Post conditions): Player viewed his/her toolbox to check which object he/she has.

Main Success Scenario (or Basic Flow):

1. Player clicks toolbox button to view his toolbar.
2. Player views his/her toolbar.

Extensions (or Alternative Flows): Nil

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2.4.7   Place Objects

Primary Actor: Player

Preconditions: Player has prevention objects in his/her toolbox.

Success Guarantee (Post conditions): Player placed objects at their appropriate places.

Main Success Scenario (or Basic Flow):

1. Player opens his/her toolbox by clicking the toolbox button.
2. Player selects the object for the toolbox.
3. Player drags the object and finally places it at the proper place.
4. Repeat step 2 and 3 until the level is complete or all the objects in the toolbox are placed at their proper places.

Extensions (or Alternative Flows):

1. Toolbox is empty. Tell the Player to find the objects.
2. Player didn't click properly on the object.
3. Player didn't place the object at its proper place so the object is moved back in toolbox.

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2.4.8   Cure Patient

Primary Actor: Player

Preconditions: Player has medicines in his/her toolbox.

Success Guarantee (Post conditions): All medicines are applied to the patient and patient is healthy now.

Main Success Scenario (or Basic Flow):

1. Player selects the object from the toolbox.
2. Player applies the medicines to the patient.
3. Repeat step 2 until the patient is cured or there is shortage of the medicines in the toolbox.
4. All medicines are applied to the patient and patient is healthy now.

Extensions (or Alternative Flows):

1. Toolbox is empty. Tell the Player to find medicines.
2. Player didn't apply medicine properly to the patient.

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2.5 Use Case Diagram

A use case diagram is a representation of a user's interaction with the system and for depicting the specifications of a use case. A use case diagram can portray the different types of users of a system and the various ways in which they interact with the system. [1]
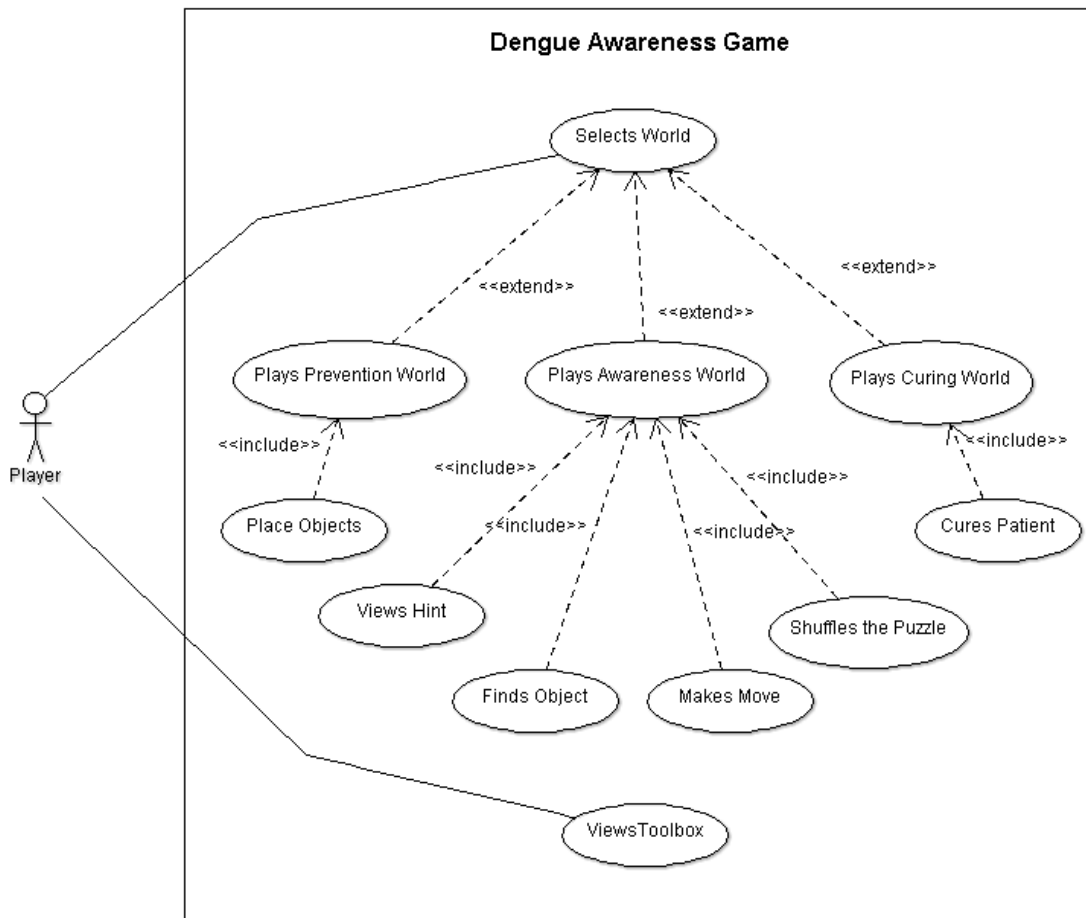

Figure 2-1 Use case diagram

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2.6 Domain Model

A domain model in problem solving and software engineering is a conceptual model of all the topics related to a specific problem. It describes the various entities, their attributes, roles, and relationships, plus the constraints that govern the problem domain [1].
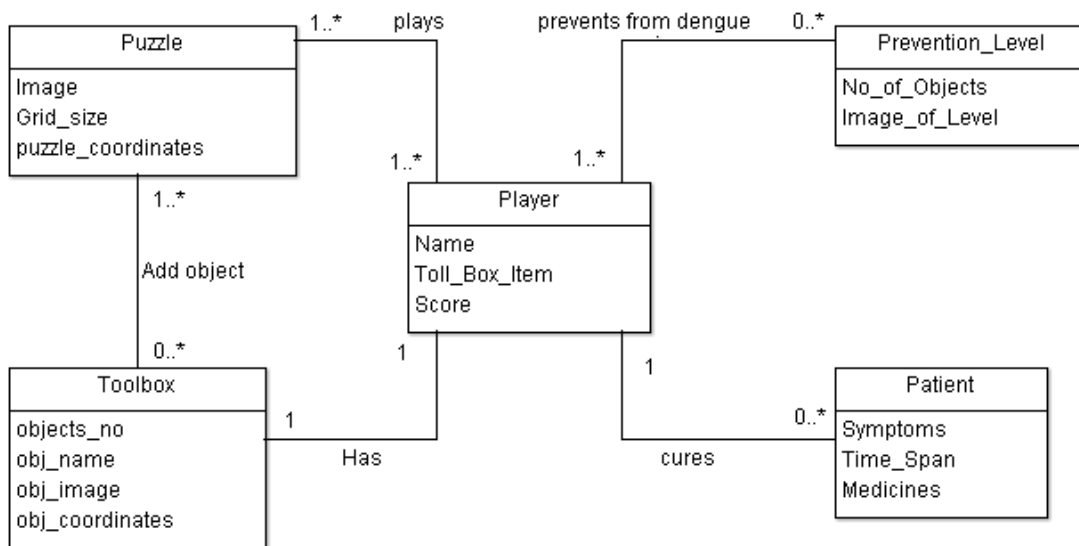

Figure 2-2 Domain model

3 System Design

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"Systems design is the process of defining the architecture, components, modules, interfaces, and data for a system to satisfy specified requirements. Systems design could be seen as the application of systems theory to product development. There is some overlap with the disciplines of systems analysis, systems architecture and systems engineering." [1]

3.1 Sequence Diagrams

"The sequence diagram is used primarily to show the interactions between objects in the sequential order that those interactions occur. Much like the class diagram, developers typically think sequence diagrams were meant exclusively for them." [4]

"One of the primary uses of sequence diagrams is in the transition from requirements expressed as use cases to the next and more formal level of refinement. Use cases are often refined into one or more sequence diagrams." [4]

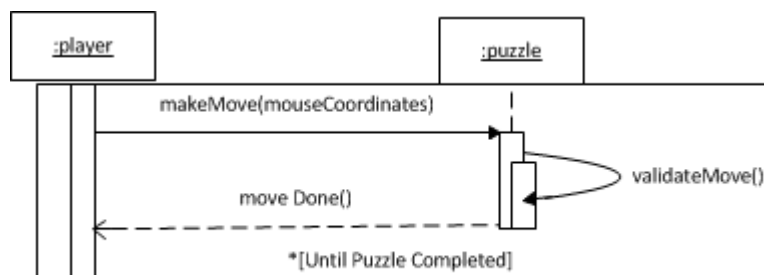Sequences Diagram of some important use cases are as follow:

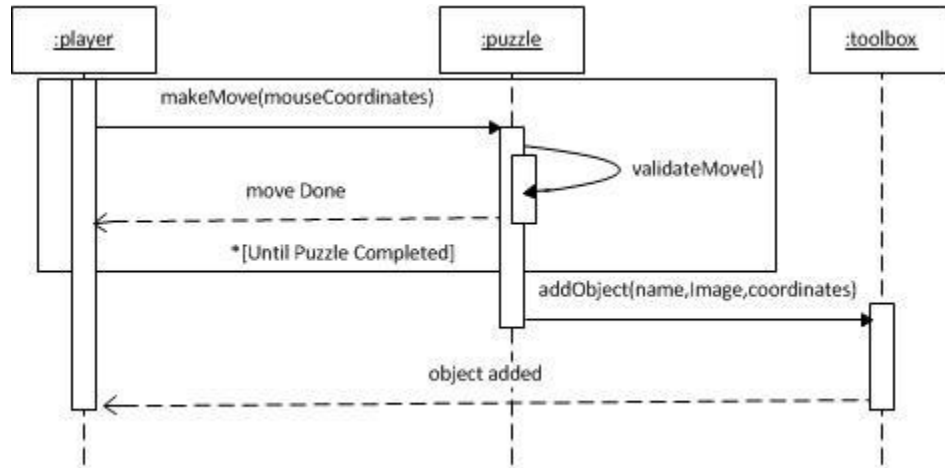**Figure 3-1 Make move sequence diagram**

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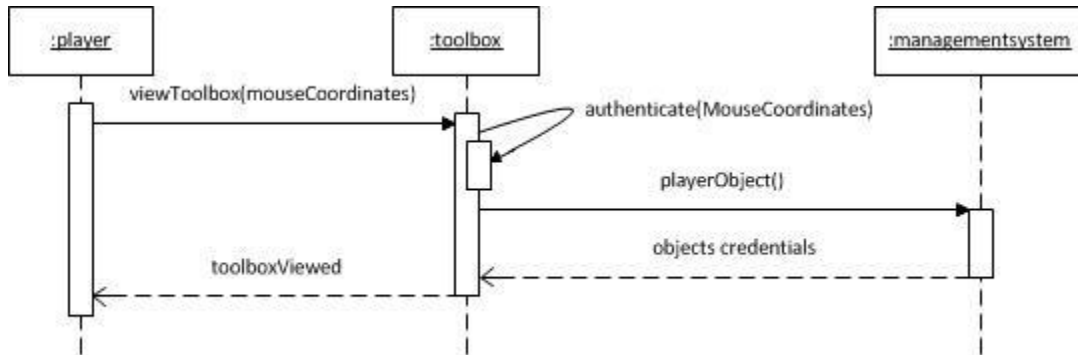**Figure 3-2 Find object Sequence diagram**

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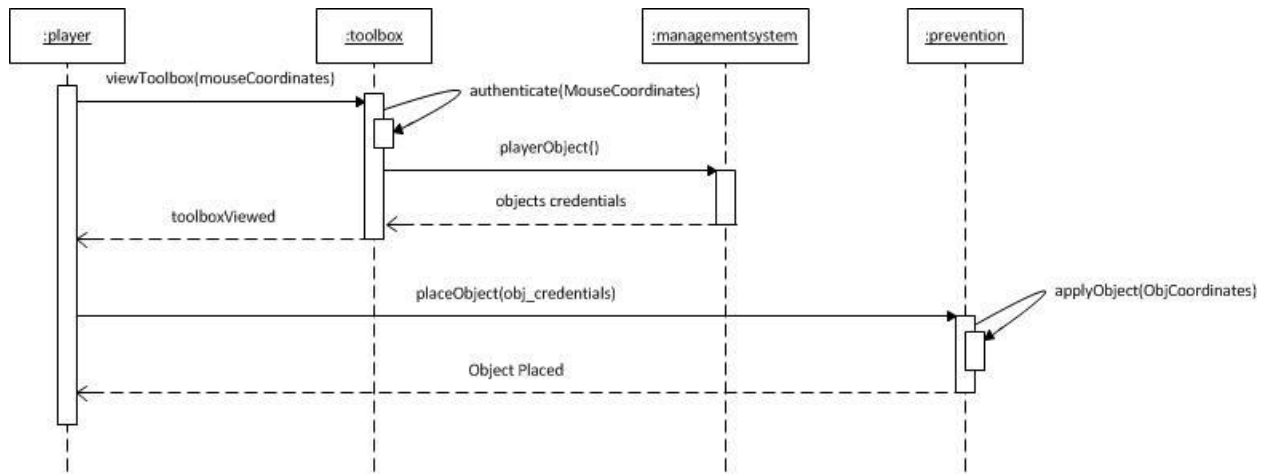**Figure 3-3 View toolbox Sequence diagram**

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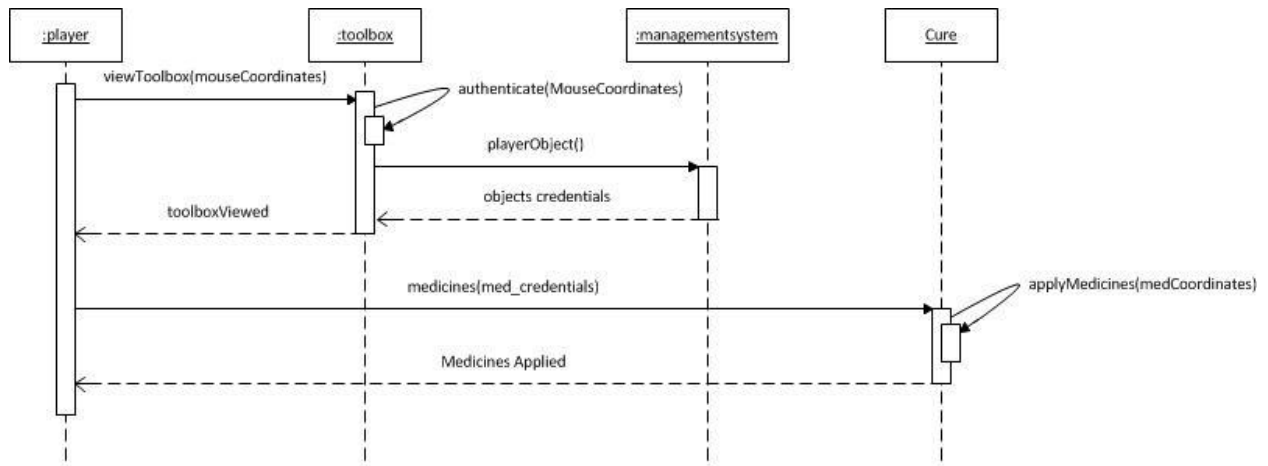**Figure 3-4 Place object sequence diagram**

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Figure 3-5 Cure patient sequence diagram

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3.2 Class Diagram

"A UML class diagram describes the object and information structures used by your application, both internally and in communication with its users. It describes the information without reference to any particular implementation. Its classes and relationships can be implemented in many ways, such as database tables, XML nodes, or compositions of software objects." [3]

3.2.1 Purpose of class diagram:

Class Diagram is used for many purposes some are as follow:

- To provide an implementation-independent description of the types that are used in a system and passed between its components. [3]
- To clarify the glossary of terms used for communication between the application and its users, and in descriptions of the users' needs. See Modeling User Requirements. [3]
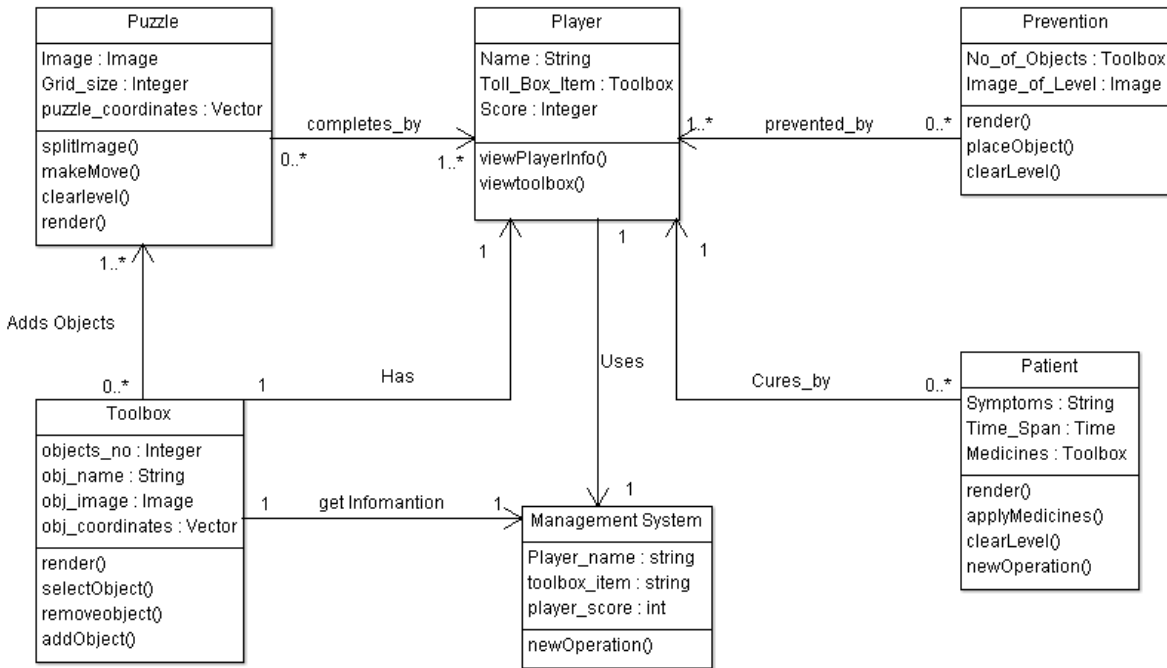
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Figure 3-6 Class diagram

4   System Implementation

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"In computer science, an implementation is a realization of a technical specification or algorithm as a program, software component, or other computer system through computer programming and deployment." [1]

4.1 Coding Environment:

For development of this project, I chose processing environment for coding. Following are the features and benefits of processing environment.

4.1.1 Processing

Processing is a java based programming language. It provides simple environment for coding with excellent support of graphics, images, sound, and many other libraries. It also provides support of physics game engines like BOX2D and Verlet Physics which are particularly used for basic games development.

4.1.2 Processing with Java

- Processing provides a simple 'front end' to Java.
- Processing requires Java SDK to be installed
- Software Development Kit
- Processing has its own library for graphics
- Java's library (API) can also be used in Processing

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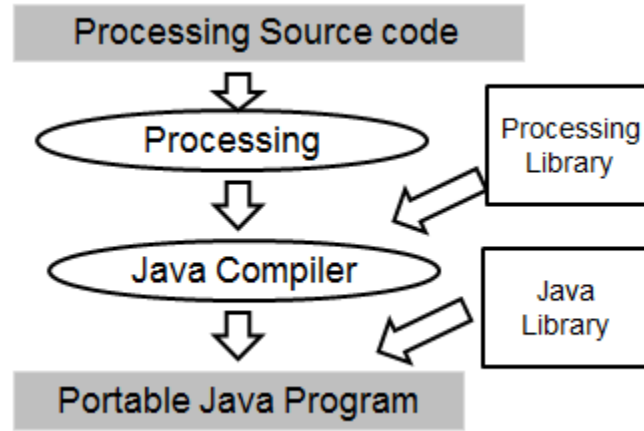
4.1.3   Processing Workflow Diagram

Figure 4-1 processing workflow diagram [2]

For the development of this game, processing is one of best option. Following are the main reasons for choosing Processing as programming environment.

4.1.4   Benefits

- Processing environment is easy to use.
- Code is simple as like java.
- It provides support for the graphics.
- It provides built in libraries for sound, and also provides support of physics game engines.
- Processing provides the facility of Cross-Platform Compatibility. The code written can be easily deployed for Windows, Linux, MAC, Android and for Web.

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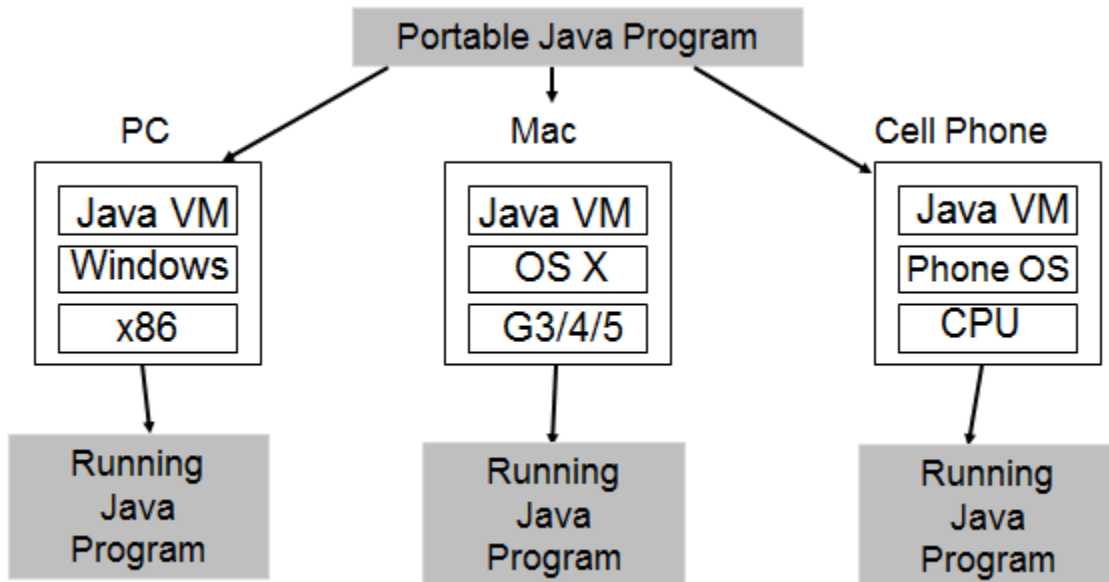### 4.1.5 Processing Code Conversion Diagram

Figure 4-2 processing code conversion diagram [2]

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4.2 Algorithm

An algorithm is an effective method expressed as a finite list of well-defined instructions for calculating a function. [1]

Some important algorithms are as follow:

4.2.1 Make Move Algorithm

This algorithm is used in puzzle class for moving the picture block to complete the puzzle. The algorithm is as follow:

makeMove (mouse_Coordinates)

{

      CheckLocation (mouse_Coordinates) \\ this give the location of the block clicked.

      If (left_neighbor = = empty)

          Swap (cell, left_neighbour)

      If (right_neighbor = = empty)

          Swap (cell, right_neighbour)

      If (upper_neighbor = = empty)

          Swap (cell, upper_neighbour)

      If (lower_neighbor = = empty)

Swap (cell, lower_neighbour)

}

4.2.2   Place Object Algorithm

This algorithm is used to pick the object from the toolbox and place it on the appropriate position of the screen to complete the prevention level. The algorithm is as follows:

placeObject (mouse_Coordinates)

{

Pick_Object (mouse_Coordinates); // this function allow to pick the object from the toolbox

If (Place_on_Screen()){

addScore;

showobject();

}

Else

Sub_score;

}

5   System Testing

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"System testing is the testing of behavior of a complete and fully integrated software product based on the software requirements specification (SRS) document. In main focus of this testing is to evaluate Business / Functional / End-user requirements." [5]

5.1 Acceptance Tests

"A formal test conducted to determine whether or not a system satisfies its acceptance criteria and to enable the customer to determine whether or not to accept the system." [6]

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5.1.1   Use Case: Select World

Test ID	T001
Tester Name	Player
Test Description	Player selects the world and starts the level.
Setup	1. Opens the game. 2. Clicks play button.
Instructions	1. Clicks Awareness World button. 2. Clicks Prevention World button. 3. Clicks Curing World button. 4. Clicks Anywhere on the screen.
Expected Results	1. Open awareness world and puzzle screen is viewed. 2. Opened prevention world and prevention level is viewed. 3. Opened curing world and curing level is viewed. 4. Nothing Happened.

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5.1.2   Use Case: View Hint

Test ID	T003
Tester Name	Player
Test Description	Player views the hint for completing the puzzle.
Setup	1. Clicks play button. 2. Selects awareness world.
Instructions	1. Clicks hint button. 2. Clicks anywhere on the screen.
Expected Results	1. Hint viewed. 2. The task is performed according to the area clicked.

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5.1.3   Use Case: Shuffle the Puzzle

Test ID	T004
Tester Name	Player
Test Description	Player shuffles the puzzle if he/she stuck anywhere.
Setup	1. Clicks play button. 2. Selects awareness world.
Instructions	1. Clicks Shuffle button. 2. Clicks anywhere on the screen.
Expected Results	1. The puzzle is shuffled. 2. The task is performed according to the area clicked.

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5.1.4   Use Case: View Toolbox

Test ID	T005
Tester Name	Player
Test Description	Player views his/her toolbox to check which object he/she has.
Setup	1. Clicks play button.
Instructions	1. Clicks toolbox button. 2. Clicks anywhere on the screen.
Expected Results	1. The toolbox is viewed on the left of the screen. 2. The task is performed according to the area clicked.

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5.1.5 Use Case: Place Objects

Test ID	T006
Tester Name	Player
Test Description	Player places the object to complete the level of prevention world.
Setup	1. Clicks play button. 2. Selects prevention world. 3. Clicks toolbox button to view the toolbox.

Instructions	1.
	
	   a) Selects net from toolbox.
	   b) Places it on the bed on the screen.
	
	2.
	
	   a) Selects repeller from the toolbox.
	   b) Applies it on the player body.
	
	3.
	
	   a) Selects medicine from the toolbox.
	   b) Places it on the table.

Expected Results	1. Net is placed on the bed. 2. Repeller is applied to player body. 3. Error! Lost in score and also object.

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5.1.6   Use Case: Cure Patient

Test ID	T007
Tester Name	Player
Test Description	Player places the object to complete the level of prevention world.
Setup	Clicks play button. Selects Curing world. Clicks toolbox button to view the toolbox.

Instructions	1.
	
	    a) Selects medicine from toolbox.
	    b) Gives it to the patient.
	
	2.
	
	    a) Selects wrong medicine (aspirin) from toolbox.
	    b) Gives it to the patient.

Expected Results	1. Medicine affected the patient and patient recovered and player got scores. 2. Patient health gone down and player lost the scores.

6 Conclusions and Future Enhancements

This game covers all the information available about the dengue virus till date but still the proper vaccine is not available for curing the disease. In future when the vaccine will be available then the cure world can be updated to the end level of cure (treatment).

REFERENCES

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[6] http://c2.com/cgi/wiki?AcceptanceTest [Last Accessed: 2 Jan 2014]

[7] http://dengue.gov.sp [Last Accessed: 25 Jan 2014]

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