An E-Learning Application for Learning Japanese Kanji

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Abstract: A Kanji is similar to an Alphabet in English, but unlike an alphabet it has its own specific meaning. Every kanji also acts as a word depicting objects, weather, behaviour, etc. Because of this very reason there are about Three Thousand kanjis in the Japanese Language depending on the dialect. Memorizing every Kanji is a very difficult task, due to the sheer number of Kanjis as well as every Kanji is to be written in a specific Stroke order. Hence it becomes very hard for Japanese as Foreign Language (JFL) students to learn Kanjis. But Japanese being a pictographic language, construction of its Kanjis is based on pictures. Hence animation sequences for construction of every kanji maintaining its Stroke Order, are to be generated and displayed, so that JFL students can learn and understand Kanjis in a creative as well as an easier method.

Keywords: Computer Graphics, Software Engineering, Pattern Recognition.

I. INTRODUCTION

Japanese Kanji being difficult for international students to learn, a methodology has to be developed, which shall make learning the same simplified and convenient.

We are about to develop a Software Environment to overcome the difficulties experienced by students while learning basic Kanjis in Japanese. Kanji being a pictographic character, a separate animation for each kanji shall be generated and depicted by the Software Environment. The animation sequence for every Kanji shall follow the stroke order in which it is drawn. The quiz shall test the acquired knowledge of the learner by generating scenarios, which shall ask the learner to select the correct kanji from a pool of options, and draw according to its proper stroke order which will be verified by pattern recognition algorithm.

(from left to right: earth,wind,fire,water.)
Fig 1: Kanji

II. PROJECT DESCRIPTION AND SCOPE

Kanjis have their own specific meaning. Every kanji acts as a word depicting objects, weather, behaviour, etc. Memorizing every Kanji is a very difficult task, due to the sheer number of Kanjis as there are nearly three thousand of them and every Kanji is to be written in a specific Stroke order. Hence it becomes very hard for Japanese as Foreign Language (JFL) students to learn Kanjis. There are two goals which are (a) Teaching Japanese Kanjis by

digitizing the traditional teaching approach followed in Japan. (b) To make students thoroughly understand the conventional stroke order of Kanjis. The objectives can be stated as follows (a) To provide fluid and compelling animations, so that learning Kanji through videos increases Student's interest in learning. (b) Rigorously yet creatively, test the knowledge that the students have acquired through this exercise.

c) To dynamically determine the error factor while pattern matching for precise results.

(d) To provide a GUI which is easy yet very much functional. (e) To design accurate queries, so that every possible answer selected for the respective question, returns appropriate result.

As Pixel-Enlightenment sequence of the input Kanji written by the student while attempting the Quiz is matched with the predefined ideal Pixel-Enlightenment sequence of the specific Kanji in the database, correct coordinates of the enlightened pixels, must be passed. Along with that an exemption function must be included, if the input enlightened pixels have co-ordinates nearer to the ideal coordinates.

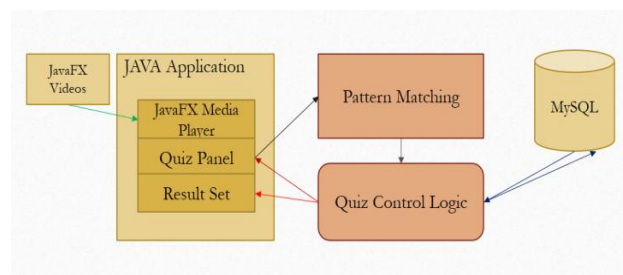## III. ARCHITECTURE AND ARCHITECTURAL PARADIGMS

Fig 2: Architecture

• **Java Application**: It is a single window that displays, Video Player, Quiz Panel and Result Set applets, when they are invoked. No applet is invoked simultaneously.
– Media Player: It is an embedded video player that shall play the animation sequences/videos over itself.
– Quiz Panel: It is the Quiz applet that can be invoked by the Student, when he/she decides to
take the quiz. Along with Question field, Navigation buttons, radio buttons, Test duration
counter, it also consists of a 'ImageField', where the Student can paint the Kanji as an answer of the specific Question.
– Result Set: The final applet over the U.I. that stored the evaluation result of the student who has just finished with the test.

• **Pattern Matching**: A Colourless Image of a Kanji is provided, which the student has to paint according to the proper Stroke order. For painting, a brush tool is provided [created using Bresenham's Algorithm], and the colouring is carried out using SEED fill algorithm.
for creating this module.
• **Quiz Control Logic**: It is designed to control the Quiz panel applet. It has an Event Listener, that emphasises the actions of the Student
(eg. Clicking CLOSE button) and generates the desirable output (eg. close the application).
• **MySQL**: It is an open-source Structured database, mainly used for storing data in an organised format. Data in MySQL being structured, follows a certain in schema in which it is been stored. Question No. to Correct Option No. mapping for MCQs is to be carried
out using MySQL.

IV. SYSTEM FLOW DIAGRAM AND ALGORITHM

• Module 1
– 1. Animation sequences depicting Kanji composition from the image of the object that the Kanji means, are to constructed using Blender at 720p resolution with 30 fps and in .mp4 format.
– 2. These videos are to be stored in MYSQL database.
– 3. End Module 1.
• Module 2
– 4. Open Video Player applet when user launches the Application window and provide Attempt QUIZ button along with the video player.
– 5. Let student select the specified Kanji video and play it.
– 6. If student clicks on 'Attempt QUIZ', jump to step 9.
– 7. Else if student clicks on 'Close', close the application.
– 8. End Module 2.
• Module 3
– 9. Load Quiz Applet.
– 10. Invoke Quiz Control Logic.
– 11. Invoke Randomiser to display random question from a pool of questions stored in database.
– 12. If Question displayed is 'Write Kanji of this Word', then jump to step 18.

– 13. Else if question displayed is 'Select Correct image choice from the following for the word', then jump to step 21.
– 14. If Last Question Answered OR Exam Time Finished, jump to step 16.
– 15. Else goto step 11.
– 16. Update the Result Set to its final state.
– 17. Close Application.
• Module 4
– 18. Provide bordered colourless image of a Kanji, along with a brush tool.
– 19. Store the correct order of enlightenment of Pixel Clusters according to the Stroke Order of the that particular Kanji, and validate the paint sequence of the user with this order.
– 20. Goto step 14.

• Module 5
– 21. Validate the choice selected by the student with the correct choice of the Question, by referring the MySQL table and
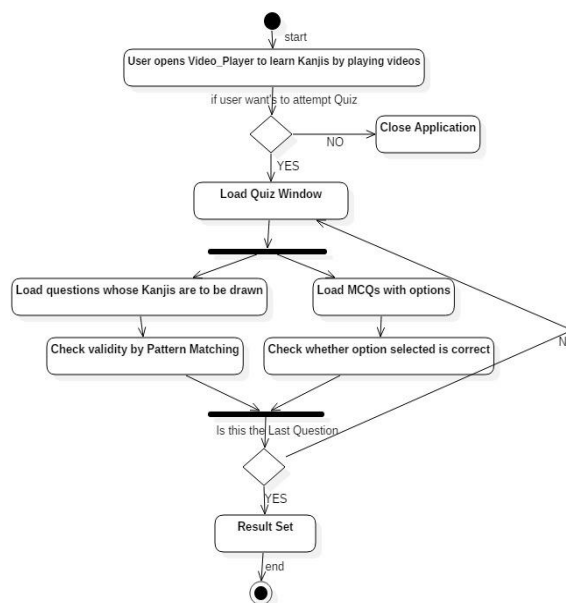generate the result set.
– 22. Go to step 14.

Fig 3: Activity diagram

V. RESULT

We have stored the unstructured data that is the images of the Kanji to be used in the questions in the structured MySQL database. This was done by converting the unstructured format of the images into the BLOB format which can be easily stored into structured database.

The User Interface created in the application is a single customized java file with inbuilt CSS and FXML documents. This has been done using javafx platform and scene builder application. Scene builder, which is linked with the FXML document serves as a bench upon which

we can add and edit the components of the UI and the layout of the screen.

A custom video player is also included in the application which will play the animation videos denoting the stroke-order and step-by-step depiction of the Kanji character based on the natural element it depicts.

This video player is made with the help of scene builder application and is included in the FXML document. This video player includes the file chooser function along with its primary functions like play, rewind, stop, pause, fast forward.

Videos denoting the stroke-order of the Kanji and its derivation from the natural element it represents is playedon the video player for easy learning of the Kanji's. These animation videos are also made by using the Blender platform.

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