

**EDA 385 Design of Embedded Systems,
Advance Course - Project Proposal**

KAERU JUMP GAME

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by

Rajesh Kumar

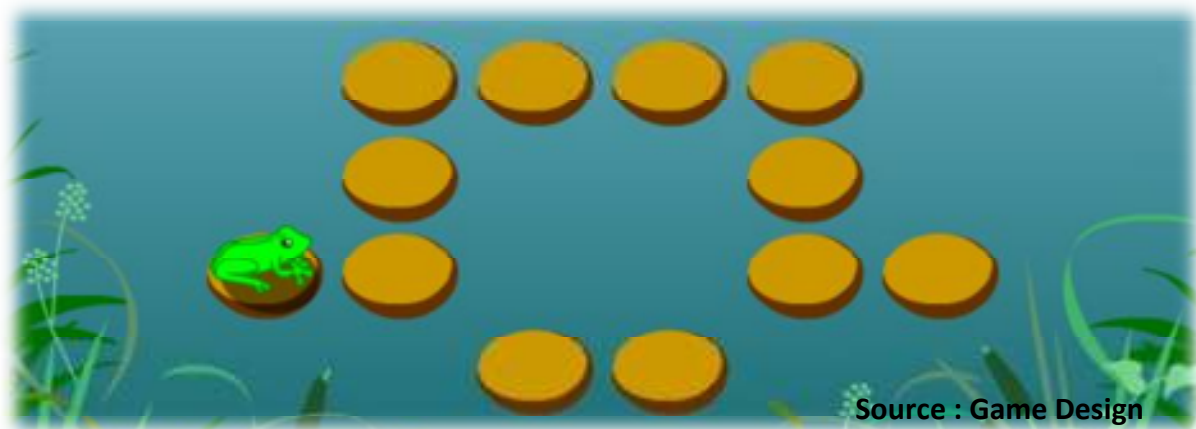
Mohan Raj Gopal

Manivannan Ethiraj

1 Description

The main idea of the project is to design famous Kaeru Jump game in a Diligent Nexys 2 FPGA Board by interfacing a monitor with help of VGA controller. The game can be played using the push buttons in the board, but interfacing a Keyboard with controller won't be a hard task. If VGA controller is finished without any hurdle in the proposed time plan, Audio controller for sound effects could be implemented.

The Kaeru Jump game is an interesting puzzle game that has more than 100 stages available online. Kaeru means frog in Japanese. The frog should jump from one pad to another and finish up with all the pads to solve the puzzle. Once the frog jumps from a pad, the pad disappears. The frog can jump to the next pad only in straight, left and right directions, but cannot travel backwards or diagonally. If the frog gets stuck without completing the pads, that particular stage should be restarted. The Game designed in the flash environment looks like below.

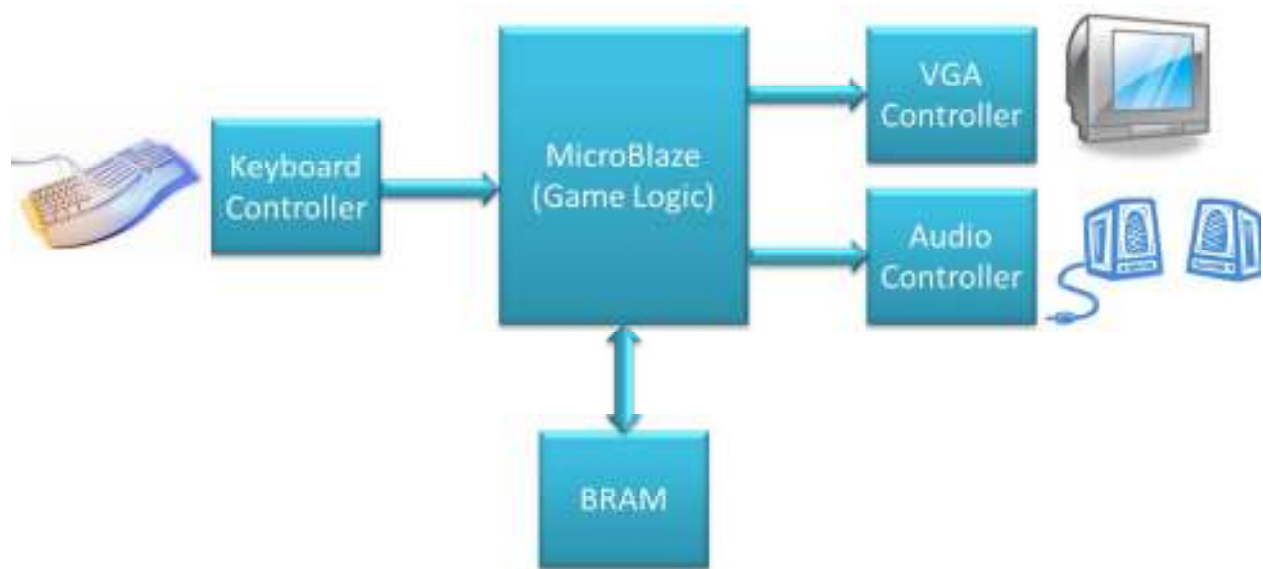


2 Implementation

The following things are needed to be implemented in hardware

- VGA controller
- Keyboard controller
- Audio controller
- Microblaze Processor

The architecture is very simple as shown below



2.1 VGA Controller

This is the most challenging part in our implementation. The main tasks are

- A 7x7 matrix of pads (squares or circle) should be created in the display with regular intervals. For each stage in the game particular set of pads only will appear on the screen.
- The frog image will be stored in the memory and will be displayed on the selected pad according to the user controls. The frog image should also rotate according to the moving direction.
- It should also display a message when the frog gets stuck in any particular pad and the stage should restart. The message is also stored in a memory as a picture.
- A background image can also be implemented for the whole duration of the game.

2.2 Keyboard Controller

The input for the game can be given using 4 buttons in the FPGA board. Even though only four controls are mandatory in the game, a control to reset the stage will be preferred by most of the users. Some more controls can also be implemented using the keyboard controller.

2.3 MicroBlaze Processor

The Microblaze processor core will be implemented using the XPS tool in the Xilinx EDK. The software game logic will be executed using the microblaze processor.

2.4 Audio Controller

An amplifier is necessary to produce sounds in the game. Amplifier can be connected to the board using PMOD interface. Implementing Audio controller depends on how successful we are in implementing VGA.

2.4 Further Improvements

The game be controlled using the mouse interface also. The Jumping (image transitions) of the frog can be displayed in the screen. Both depends on the time available at the end.

3 Estimated Time Plan

Weeks	Task
3	Architecture of game logic
3-4	PS2 Interface
3-5	VGA Controller
4-6	Software design of game logic
6	Stitching the modules together and Debugging
7	Audio Controller (<i>if possible</i>)
8	Report