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Project Proposal: Digital Stereoscope

Project Description

Our group will design a 3D engine that would process a 3D pixel map and convert it to two 2D images which will be displayed on two monitors, each viewed by one eye. The purpose of this is to trick the eye into believing that the person is actually in a 3D environment. The reason why this works is the human left and right eyes see slightly different images and if we can correctly extract these two images and display them to the corresponding eyes then it is possible to trick the brain into believing that it is seeing a 3D object.

Implementation

Memory

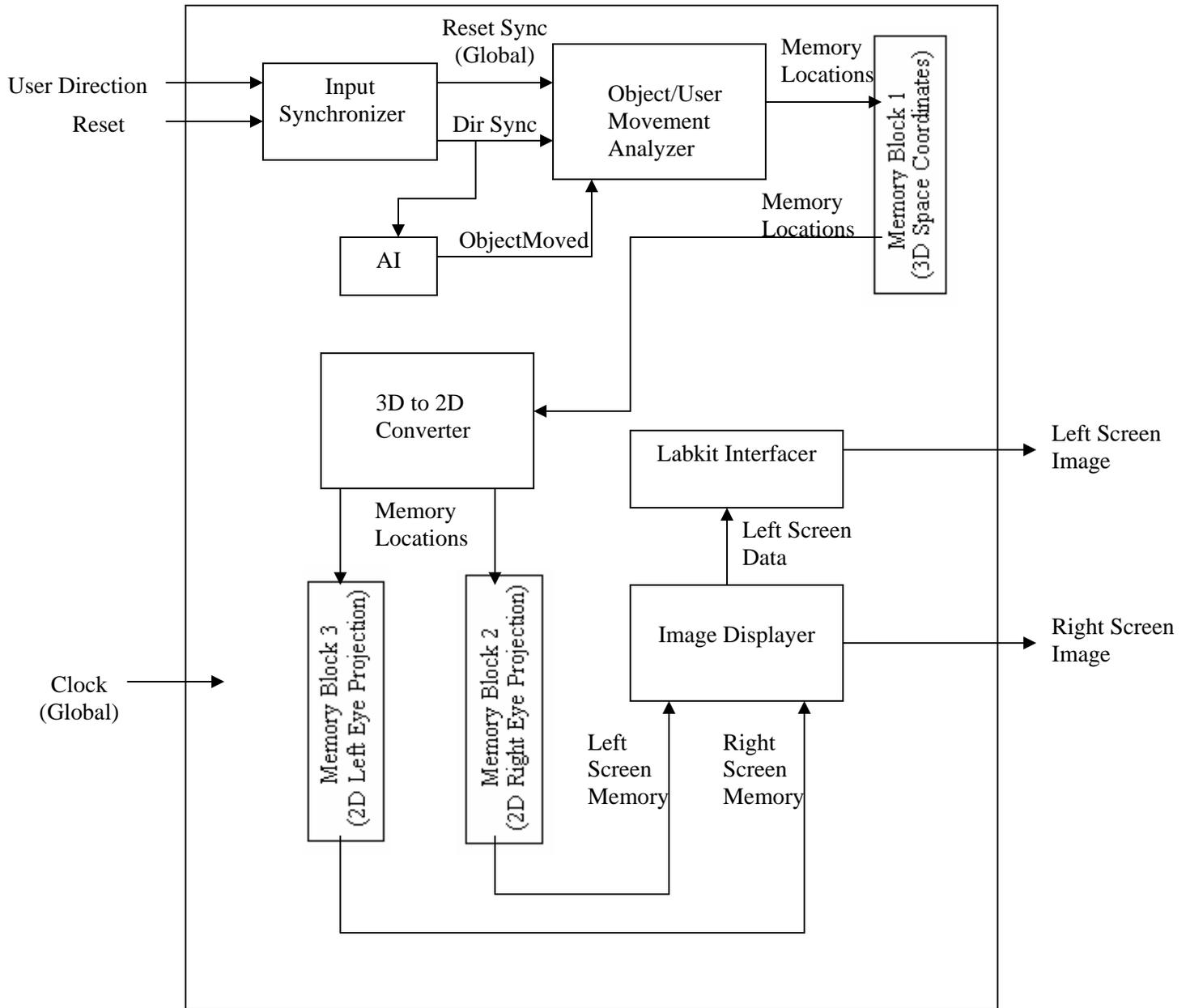
Our group will have 3 memory blocks. Memory block 1 will store the pixel information of our 3D virtual space (i.e. x,y,z coordinates of our object). Memory blocks 2 and 3 will store information for the images which will be displayed on the 2 monitors.

Modules

We would have 3 main modules. The first main module will be the Object/User Movement Analyzer. It will check every frame if the user or any object in our 3D space has moved. Objects and user can move forward, backward, left or right. It refreshes the memory to store the updated 3D pixel locations of the objects in our 3D space. The second main module will be the 3D to 2D converter. It gets the 3D locations from memory block 1 and calculates the projection onto two 2D planes from 2 focal points, which correspond to the different viewpoints of the human eye. It then uses these calculations to store pixel values into memory blocks 2 and 3. Our third main module would display the 2D image projections into 2 monitors. It would take values from memory blocks 2 and 3 and outputs them to the monitors.

We will have minor modules such as mini AI module which generates basic sets of object motions. We would also include a input synchronizer module which collates user directional input data, and reset input. We may also need a labkit interfacer module which accommodates communication between 2 labkits. If time allows, we may include a sound effects module.

Digital Stereoscope Block Diagram



Testing

Object/User Movement Analyzer

We will begin by creating simple 3D objects such as a cube, which would allow us to see if Memory block 1 stores the object position in 3d space correctly. The next test would be to move the cube or the user and make sure the memory updates properly. After this we will try using more complex objects or shapes and try multiple moving objects.

3D to 2D Converter

We will pre-program a three dimensional object in Memory block 1 and check to see if the converter stores the two dimensional projection of the images into memory block 2 and 3 correctly. Mathematical calculations can be done of what the results should be and then compared with what is stored in memory. We can start by using simple objects and moving to more complicated ones.

Image Displayer

We can feed the displayer pre-programmed images to see if it will send it to the screen properly. Also, it is possible to check the output pins of the labkit to make sure data for the second monitor is being sent out correctly before working on finding a way to attach a second labkit and monitor to the system. Finally, after getting two monitors to work together, we can try using it to see if the images are different and that they generate what seems to be a three dimensional object.

Input Synchronizer

We could assign certain LEDs to light up if a certain user input is pressed.

AI Module

Once the rest of the modules are working, we would just view from the screens if our AI is working properly.

Labkit Interfacer

We would check if the correct control and output data is being passed across the labkits using a logic analyzer.

Work Division

Tony – Object/User Movement Analyzer, Input Synchronizer

Steven – 3D to 2D Converter, AI Module

Joshua – Image Displayer and Labkit Interfacer