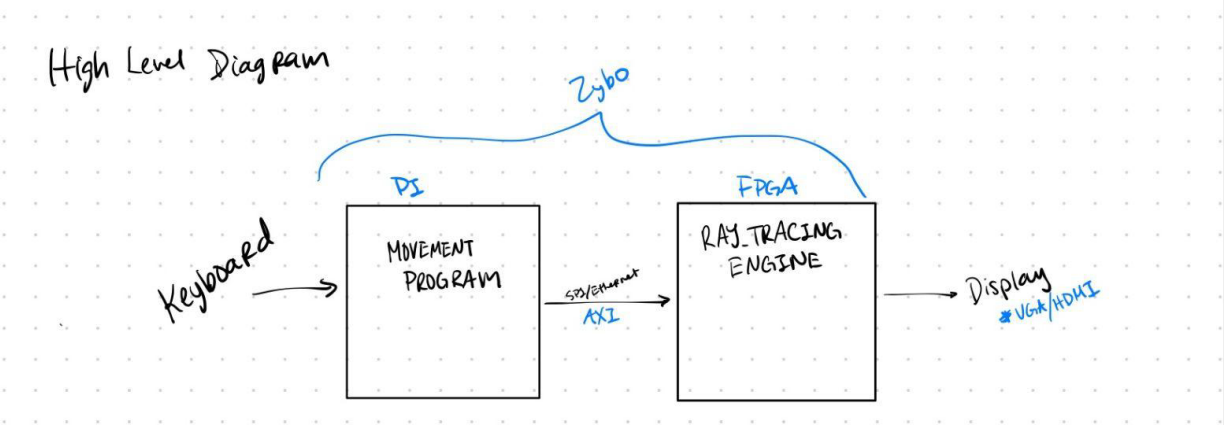
Lab proposal

Real-Time Ray Tracing Engine with Embedded Linux Control

My project aims to make a real-time ray tracing graphics renderer. The system will allow a user to interact with a virtual scene, moving the camera around, through keyboard inputs and output to a display. The project can be broken down into 2 parts; The movement software and ray tracing hardware.

The movement software will read keyboard inputs send the camera position to the hardware module to generate the scene. If I can the Zybo Z7 board running either PetaLinux or FreeRTOS, the software will send the camera position to the hardware through the AXI-Bus. If not possible I will use a Raspberry Pi to complete the same purpose but communicate through SPI.

The ray tracing hardware will interface with the software through either AXI or SPI and output to a display through either HDMI or VGA. The hardware will have the communication interface, an objects memory, a camera position register, a frame buffer, display module, the ray tracing unit, as well as the controller. The Communication Interface will decode messages from the CPU leaving the controller to deal with how to deal with the instruction. The Objects memory will be stored in BRAM since not many objects will be in the scene. The Framebuffer will have 2 level memory system with the main frame being stored in DRAM and a cache for sending data to the display module to output the image. The Ray Tracing Unit will be the perform the ray tracing algorithm and update the frame buffer to be displayed. This will all be done on the Zybo board if I can get it working or done. Or on a Nexys A7-100T since it will only be hardware, and not deal with the vivado and vitis.



Ray Tracing Engine