

Team 11

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Project Name:

Retro Upscaler Box (R.U.B.)™

Project Synopsis:

Composite video upscaler for retro video game consoles, that improves image quality relative to linear interpolation used by modern high resolution displays.

Project Description:

The upscaler would allow users to plug in their game console, specifically targeting older consoles, and then from the upscaler to their tv. The upscaler will allow input of composite video signals and perform a conversion to digital formats for use in modern displays. There's a large number of retro game enthusiasts that wish to use their old consoles with modern, high resolution, large-format displays. Most scalars included with TVs will perform a linear interpolation of the video when the input is smaller than that TV's native resolution. This results in a blurry image that can be difficult to use, on top of just being subjectively dissatisfactory. This product will perform a scaling of the signal to the native resolution of the target display in a method that preserves sharpness. We are aiming to find a middle ground between raw signal processing and frame analysis to provide a more accurate fit for larger resolutions rather than just multiplying pixels (or performing a linear interpolation as current displays already do), and to provide minimal lag between console output and what is shown on the screen. Currently solutions in this field take either a direct frame analysis approach, resulting in large delay, or use direct signal manipulation which results in a product that is very fast, but can make sacrifices in exact target resolution and processing (such as deinterlacing).

Project Milestones:

First Semester

- Identify existing products
- Identify the weaknesses of the existing product
- Define the improvements we wish to seek
- Begin search for hardware
- Device Block diagram

Second Semester

- Research analog to digital signal processing (audio and video)
- Research frame analysis
- Decide on balance of signal processing to frame analysis
- Construct final product
- Test

Project Budget:

- (\$300 - \$400) Microcontroller/Microprocessor Board (Multicore?)
- (\$5 - \$10) Some number of RCA Terminals
- (\$10 - \$20) Some number of HDMI Receptacles.
- (\$5) Cables
- (Provided by Members) Game Consoles.

*Most of these products can be found on popular marketplaces such as amazon, but could potentially be found from one of the preferred vendors such as CDW or Stanion Wholesale Electric. It may be harder to find the specific microcontroller we wish to use since the required controller needs to be capable of handling intense video input and manipulation. As a result, there is a chance we would need to purchase boards from a non preferred vendor such as Mouser Electronics.

*We should not need too much training to work with these products due to everyone's experience with electronics from EECS 140 and EECS 388.

Work Plan:

We have some ideas on division of work, but nothing concrete. Many of the tasks we need are research or exploration based, so it'd be easy to have people do it on their own time, and then come together to share what they've learned. We could divide topics out amongst the members and try to have different members become some kind of relative subject-matter expert, but what we're looking for is a novel *combination* of ideas. To that end, the research and brainstorming processes are the responsibility of all members. However, there are some already solved problems that could be assigned, such as converting video and audio from the source composite format to some intermediary digital one, and then again into an HDMI output. As of now, it is likely that everyone will do a mild amount of research on the idea of video upscaling so we all have a good basis for the product idea. For the first semester, Varun will look into possible microcontrollers to utilize for the product. Gage will look into frame analysis and the conversion from an analog format to a digital one. Noah and Melody will also investigate frame analysis and possible output formats (HDMI). Joe will help Varun investigate hardware, and also investigate the conversion from composite signals. Please note that the minutiae of these plans are subject to change due to the fact that the project is still in early phases of development.