

Design Document and Feasibility Study

Hardware System:

The system would basically be a combination of 3 Raspberry Pi Pico, 2 5MP ArduCam Camera module, 2 SD Card extension, 2 SD Card, 2 Microphone module and (optional) Power Management Module like TP4050. 2 Raspberry Pi Pico used for each 'eye' of the stereo system and each will house their own camera, microphone and sd card connection to it. The last raspberry pi will be used to synchronize both Raspberry Pi and (optional) wireless connection.

Component List:

1. 3x Raspberry Pi Pico (1 possibly being Pico W, Wireless included) ([Raspberry Pi Pico | The Pi Hut](#)) ([Raspberry Pi Pico W | The Pi Hut](#))
2. 2x 5MP ArduCam Camera module, OV5642 Mini SPI Camera Module for Raspberry Pi Pico ([5MP OV5642 Mini SPI Camera Module for Raspberry Pi Pico | The Pi Hut](#))
3. 2x SD Card SPI Breakout Board ([Adafruit Micro SD SPI or SDIO Card Breakout Board - 3V ONLY! | The Pi Hut](#))
4. 2x 32GB MicroSD Card ([SanDisk MicroSD Card \(Class 10 A1\) | The Pi Hut](#))
5. 2x Electret Microphone Amplifier ([Electret Microphone Amplifier - MAX4466 with Adjustable Gain | The Pi Hut](#))
6. Breadboard for Pico ([Breadboard for Pico | The Pi Hut](#)), to speed up prototyping as the breadboard have pin labels, as Rasp Pi Pico don't have silkscreen labelling on its PCB.
7. 140 Degree Lens in case 60 Degree isn't good enough for stereoscopic imaging ([M12 Lens - 140-Degree Ultra-Wide Angle with Raspberry Pi HQ Camera Adapter | The Pi Hut](#))
8. TP4050 Charging Board (optional if using LiPo is within scope), first prototype will be powered with power bank/AA battery first.

Related Resources:

1. [Expand Your Raspberry Pi Pico's Memory by Adding a microSD Card Reader! Plus SPI & Module Creation. - YouTube](#)
2. [sdcardio – Interface to an SD card via the SPI bus — Adafruit CircuitPython 9.0.0-alpha.1 documentation](#)
3. [Arducam Mini Module Camera Shield 5MP Plus OV5642 Camera Module for Arduino UNO Mega2560 Board \(uctronics.com\)](#)
4. [ArduCAM/PICO_SPI_CAM \(github.com\)](#)

Software System:

The software system would also consists of related pipeline/workflow required to preprocess (stitch together) the 2 images/videos pair from each different 'eye' camera module, most likely using ffmpeg, handbrake, or video editing tools. This will then be projected to VR (Virtual Reality) HMD (Headset Mounted Display), in my case which is Pico 4, using desktop PCVR app developed on most likely, Godot 4.0 with its newly added XR support. After getting advice from very helpful Godot Dev, Bastiaan "Mux213"

Olij, from their #xr channel in their Godot Discord, it is confirmed the idea is feasible, in which SBS video player can be achieved just by modifying this tutorial ([Godot VR Video Player Part 1 - YouTube](#)) and adding some shaders code that adjust the specific side of eye to corresponding headset 'eye' display. This is the boilerplate code kindly provided from him which I will try to implement and improvise:

```
shader_type spatial;

render_mode unshaded;

uniform sampler2D movie : hint_color;

void vertex() {
    UV = vec2(UV.x * 0.5, UV.y);
    if (VIEW_INDEX == VIEW_RIGHT) {
        UV.x += 0.5;
    }
}

void fragment() {
    ALBEDO = texture(movie, UV).rgb;
}
```

Budget:

Budget for 3rd Year IP = £150

No.	Item	Function	Cost (£)	Quantity	Total	Link
1	Raspberry Pi Pico W	Signal/Control/Main Pico	6.3	1	6.3	Raspberry Pi Pico W
2	Raspberry Pi Pico	Eye'/Camera Pico	3.9	2	7.8	Raspberry Pi Pico
3	5MP ArduCam Camera module, OV5642	Camera Module (SPI)	35	2	70	5MP OV5642 M
4	SD Card SPI Breakout Board	SD Card 'reader' (SPI)	3	2	6	Adafruit Micro
5	32GB MicroSD Card	Storage	8	2	16	SanDisk MicroS
6	Electret Microphone Amplifier	Audio recorder	6.9	2	13.8	Electret Micro
7	Breadboard for Pico	Prototyping	4.2	1	4.2	Breadboard fo
8	140 Degree Lens	Optics (hopefully not needed)	19	0	0	M12 Lens - 140 Hut
Total =					124.1	