# JSC Senior Design Project and or Intern Request Form

## Project Title:
Live Video Stitching - Point of View Change

## Project Description:
NASA/JSC desires a general purpose software based solution for stitching live video from multiple cameras together to allow the user to achieve point of view changes when a change in the user’s relative position is sensed (assume modest shift in head position as if you lean to see something out of a window). This would enable crewmembers to seamlessly inspect their spacecraft and objects near the craft without having to perform actions to switch cameras to see around occlusions and better enable them to identify feature/object position relative to other spacecraft features or landmarks.

## Choose most appropriate area of research:
- [x] Planetary Surface Systems
- [ ] Ground Operations
- [ ] Propulsion
- [x] Spacecraft
- [ ] Human Health Program

## Program Applicability:
- [ ] ISS
- [ ] CEV/SLS
- [ ] Commercial Crew
- [ ] Asteroid
- [x] Adv. Technology (AES/STMD)

## Choose one project:

### Roles and Responsibilities of Senior Design POC/Mentor

**XSenior Design**
I have coordinated with my management and I am able to support at least three (3) teleconferences (kick-off, mid-term, and final) with a Senior Design Project Team at a university that chooses my project. I understand that I shall not provide any sensitive or classified information to the Senior Design Project students of faculty. I will provide feedback to the project team if requested.

**Internship**
I have coordinated with my management and I am able to support an intern. If an intern is selected for my project, I will provide an environment where an intern can grow and we may have a mutually beneficial and successful internship. My project will be able to provide a desk space, work area, and computer for an intern. I will review any final report or presentation that the intern generates during his/her internship and submit it to Export Control (DAA) for approval. This project opportunity will be posted in OSSI, through the office of Education (use exact same title). OSSI website: [https://intern.nasa.gov](https://intern.nasa.gov)

## Check desired Timeframe for Internship:
- [ ] Year long
- [ ] Summer
- [ ] Fall
- [ ] Spring

## Check desired Major/Minor(s) for Internship:
- [ ] Aerospace Engineering
- [ ] Aeronautical Engineering
- [x] Astronautical Engineering
- [ ] Biomedical Engineering
- [ ] Chemical Engineering
- [ ] Civil Environmental
- [x] Health Engineering
- [ ] Electrical, Electronic Engineering
- [x] Computer Engineering
- [ ] Engineering Physics
- [ ] Industrial Manufacturing Engineering
- [ ] Materials, Metallurgical Engineering
- [ ] Mechanical Engineering, Mechanics
- [ ] Nuclear Engineering
- [ ] Astronomy, Astrophysics
- [ ] Chemistry
- [ ] Optics
- [ ] Physics
- [ ] Atmospheric Sciences
- [ ] Geography
- [ ] Geosciences
- [ ] Oceanography
- [ ] Natural Resource Management
- [ ] Mathematics, Applied Mathematics
- [ ] Computer Science
- [ ] Astrobiology
- [ ] Biology
- [ ] Biochemistry/Biophysics
- [ ] Microbiology
- [ ] Bacteriology
- [x] Chemical Engineering
- [ ] Other, please specify:

## Mentor Name:
Max Haddock

## Mentor’s E-mail:
Maxwell.d.haddock@nasa.gov

## Title & Organization:
Engineer - NASA/JSC Engineering Human Interfaces Branch (EV3)

## Phone #:
281-483-7241

## Alternate POC/Mentor Name:
Helen Neighbors

## Alternate’s E-mail:
Helen.neighbors-1@nasa.gov

## Education Office Signature and Date:
Intern Mentor’s Signature & Date:

## As supervisor/manager, I approve of the above named individual as Senior Design Project POC of Intern Mentor.

## Supervisor/Manager’s Signature & Date:
Texas Space Grant Consortium
Senior Capstone Project

Project Title: Live Video Stitching – Point of View Change

Description:
NASA/JSC desires a general purpose software based solution for stitching live video from multiple cameras together to allow the user to achieve perspective changes when a change in their relative position is sensed. This would enable crews to seamlessly inspect their spacecraft and objects near the craft without having to perform actions to switch cameras and better enable them to identify feature/object position relative to other spacecraft features or landmarks.

Requirements/Constraints:
The solution should:
- initially address stitching 2 camera streams together but also be extensible to more cameras
- minimum camera resolution and frame rates will be 720p and 30FPS, respectively
- a solution using 3D cameras and display is encouraged but not required
- the solution should work for a field of interest ranging from 5 - 20 meters
- the solution should work for reasonable alternatives in camera mounting positions (examples: cameras may not be mounted on exactly the same plane, camera spacing may vary, etc.. )
- the resulting imagery should have low/no distortion and the blending from one camera stream to the next should not preclude object and feature identification
- the relative position sensing to generate user view angle can be achieved via keystroke or mouse inputs but should be easily modified to allow for an external device and concurrent software (such as a Kinect sensor) to generate a relative position input so that the user can change their perspective ‘hands-free’
- end-to-end latency of <0.5 seconds for the lab demonstration

Desired/Expected Outcome:
Desire a working prototype and demonstration. If successful we will want to replicate and build upon it at JSC. Resulting code and system specifications should be available for NASA to perform continued experimentation with no licensing fees. Cameras and computer can be loaned to the university as needed to keep cost down and ease the level of effort to replicate the solution at JSC.

Project Lead Contact Info:
Max Haddock
281-483-7241

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Displays and Controls Engineer, EV3/Human Interface Branch

EV/Avionic Systems Division, Johnson Space Center, NASA

Preferred contact mode and times – telephone M-F reasonable hours; email anytime