PROJECTED AR

ZACHARY LONG, DILAN PRASAD, SIDDHARTH AKALWADI AND SHORYA MALHOTRA

MULTIMEDIA, HYPERTEXT AND INFORMATION ACCESS (CS 4624)

PROFESSOR EDWARD FOX

VIRGINIA TECH, BLACKSBURG VA 24061 | 12/07/2021

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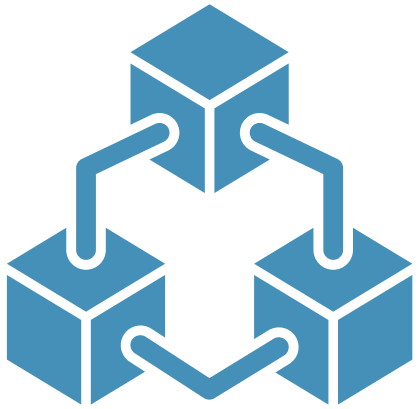


Project Background

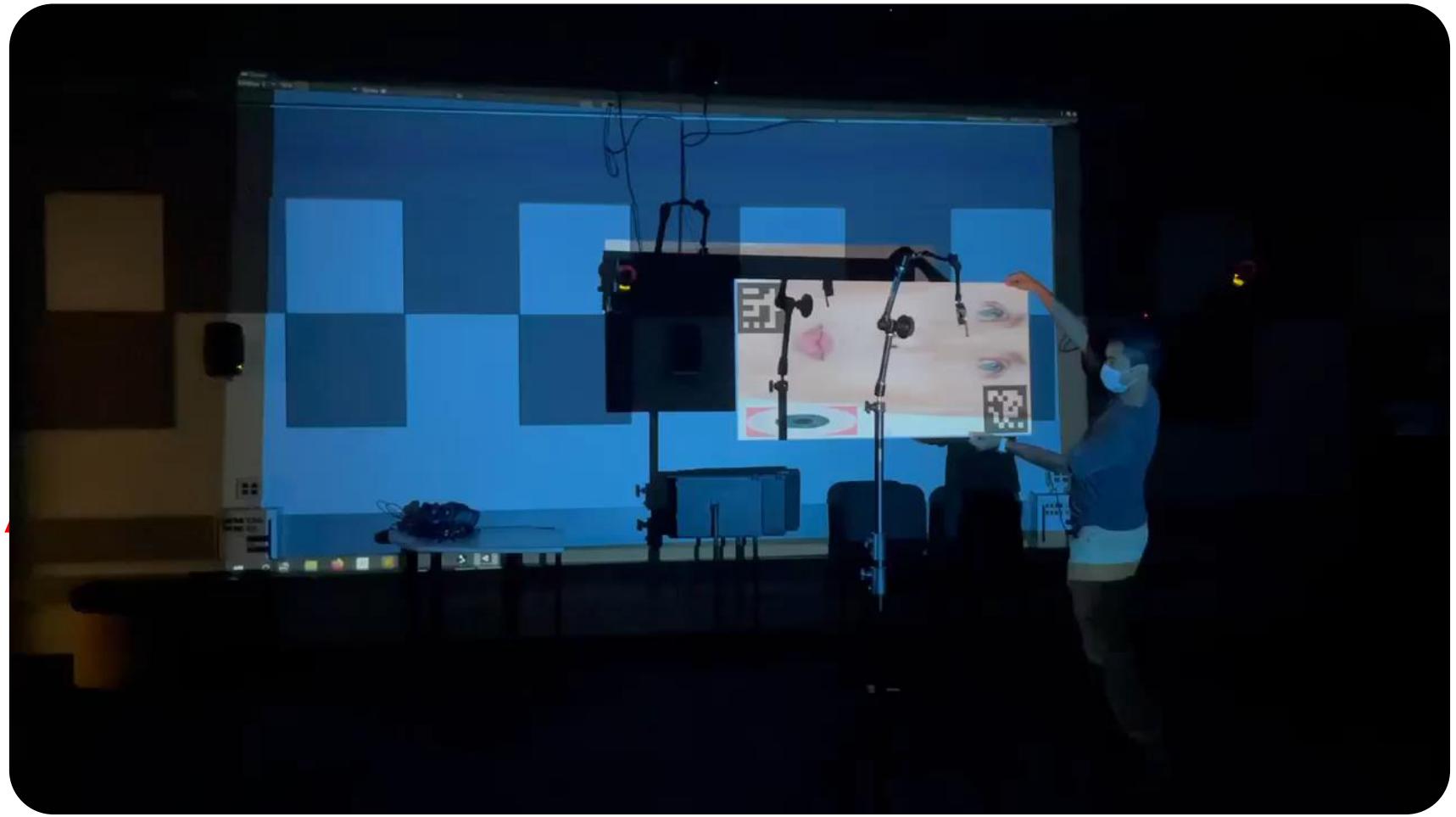
Project Requirements

Project Research

PROJECT OVERVIEW

PROJECT BACKGROUND

- Glasses-free AR system
- Project images onto moving objects in 3D space
- Goal: Calibrate Unity camera to match projector display



PROJECT REQUIREMENTS

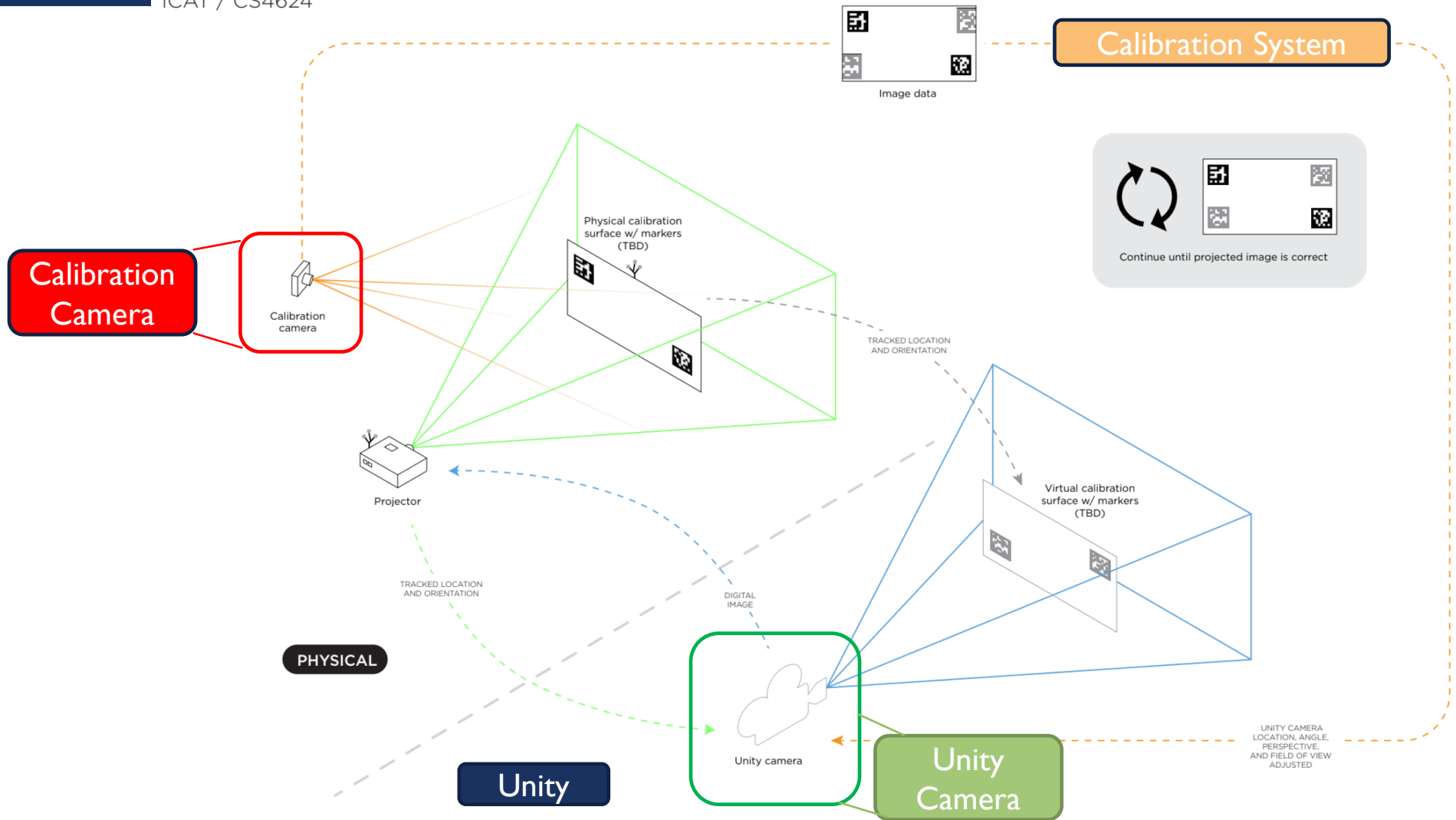
Automated Calibration System

Documentation

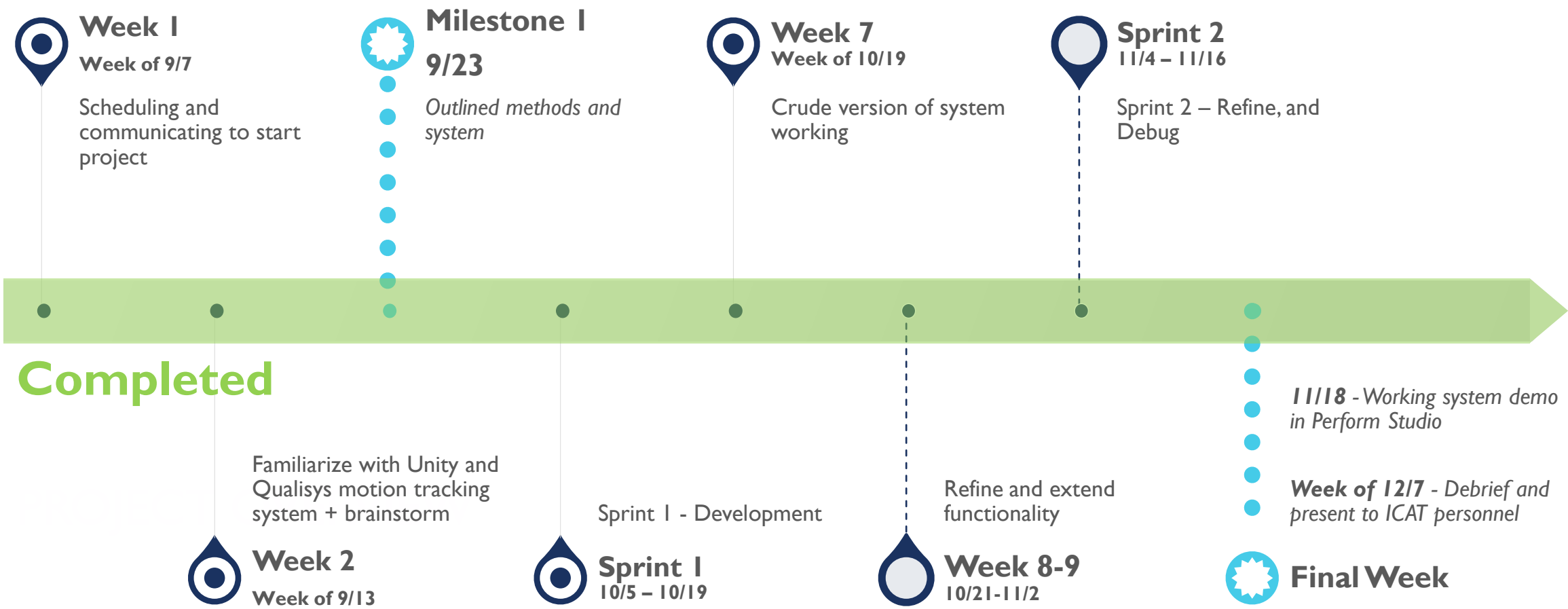
PROPOSED PROJECTED AUGMENTED REALITY

CALIBRATION SYSTEM

ICAT / CS4624



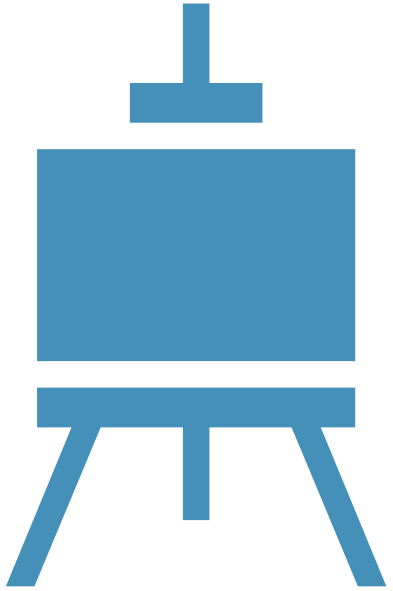
Timeline and Milestones



PROJECT RESEARCH

University of Tokyo Research

Lightform



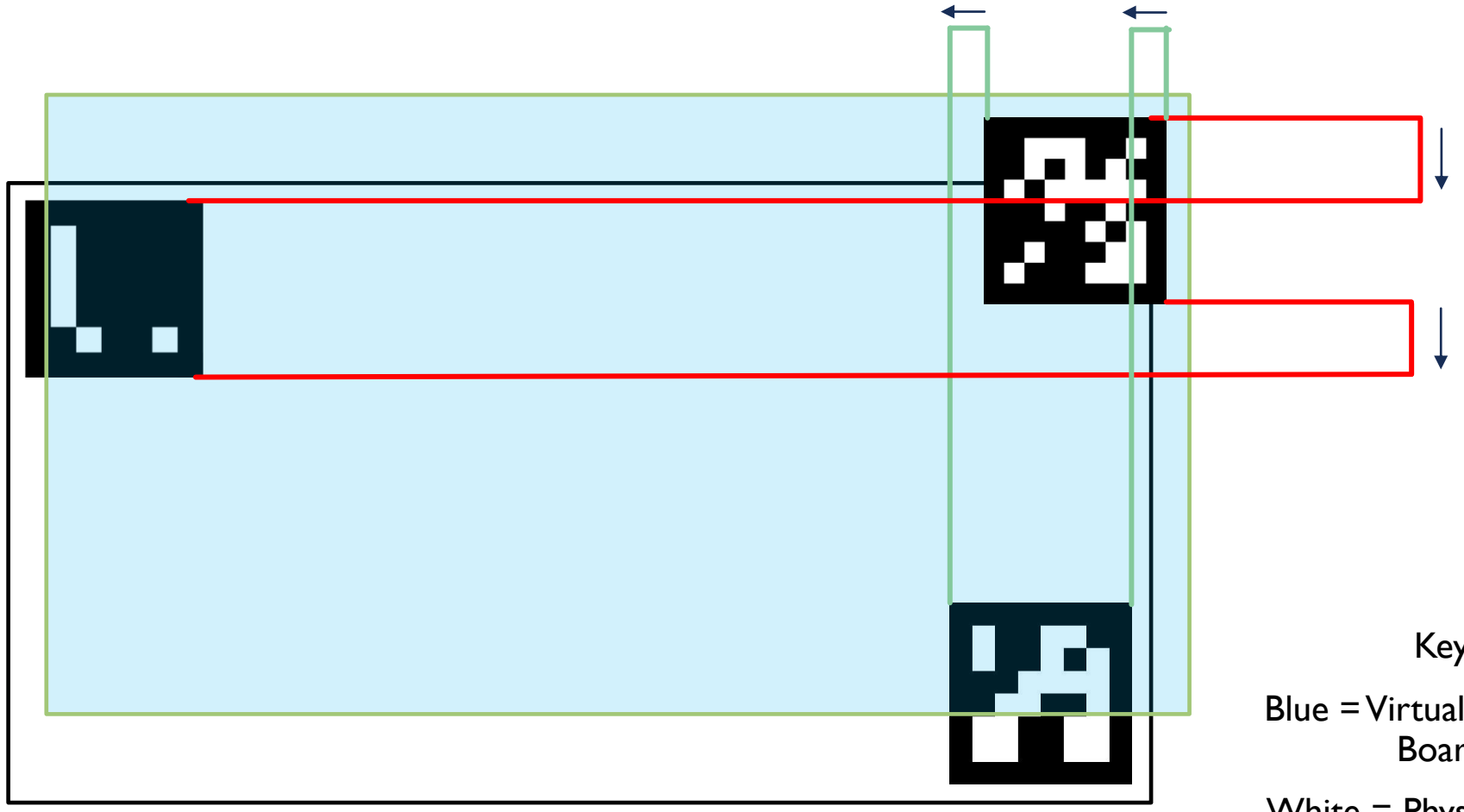
Initial Design

Problems Faced

PROJECT DEVELOPMENT

INITIAL DESIGN

Rotation/Panning



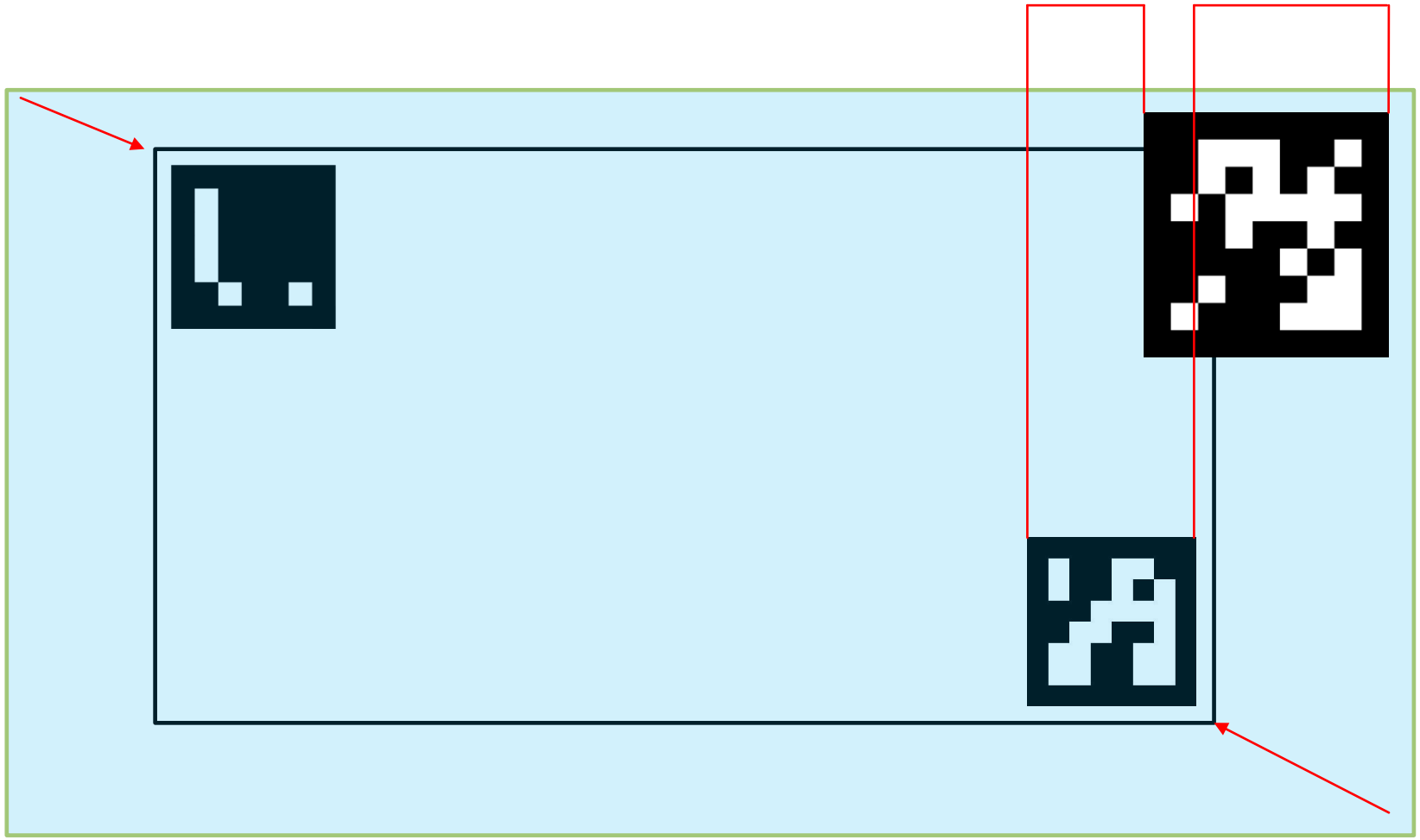
Key

Blue = Virtual/Projected Board

White = Physical Board

INITIAL DESIGN

Field of View/Scaling



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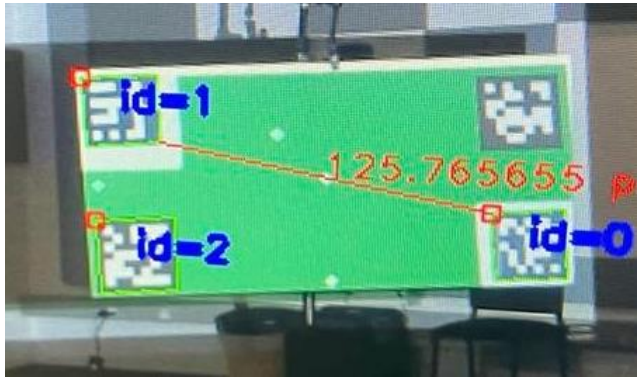
INITIAL DESIGN

Goal

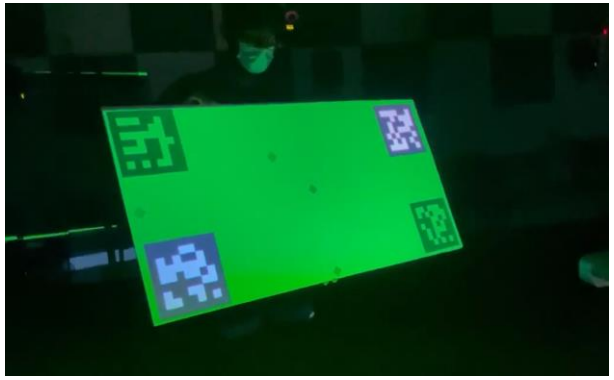
PROBLEMS FACED

Poor OpenCV C++ documentation

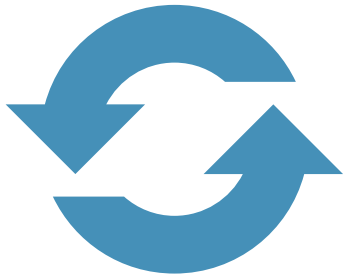


Difficulties seeing ArUco markers in certain lighting

Issues recognizing C++ DLL in Unity



Assumptions about a marker landing on calibration board



Updated Design and Implementation

Working System

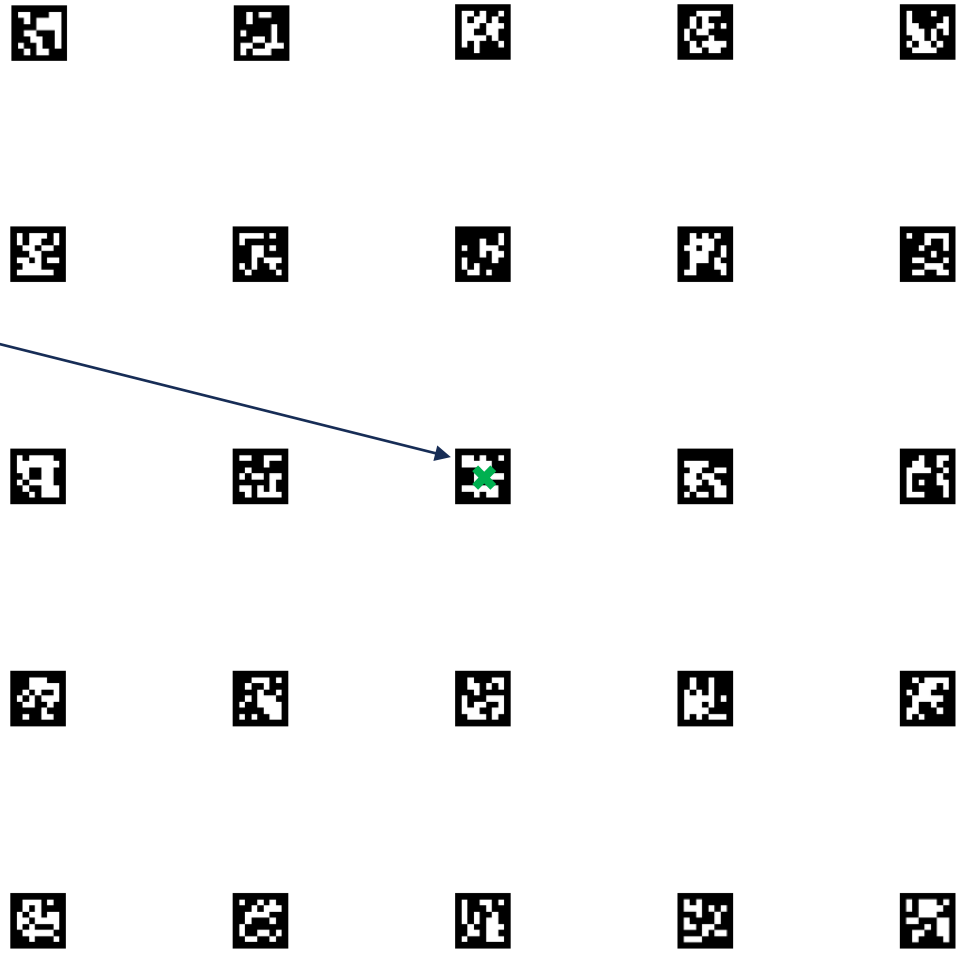
System Testing

Deliverables

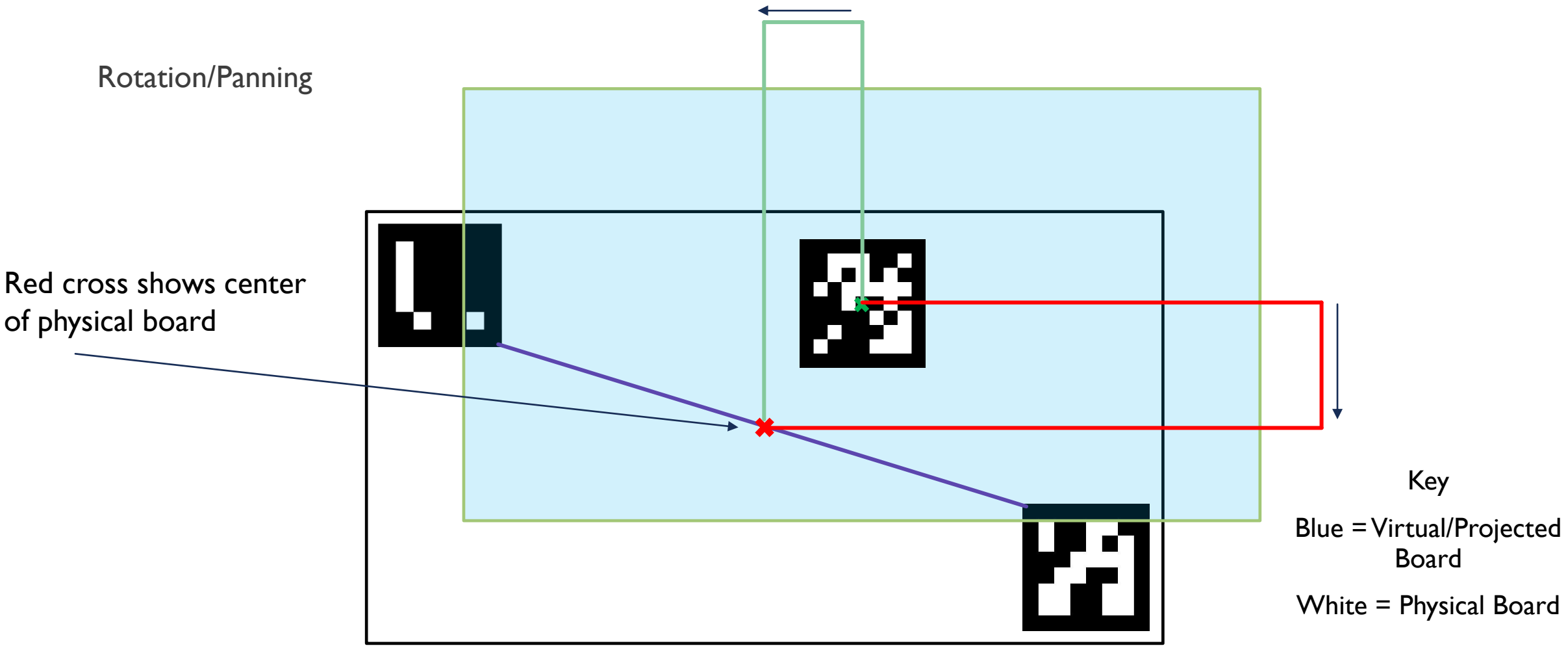
PROJECT COMPLETION

UPDATED DESIGN AND IMPLEMENTATION

Green cross shows
center of scatter board

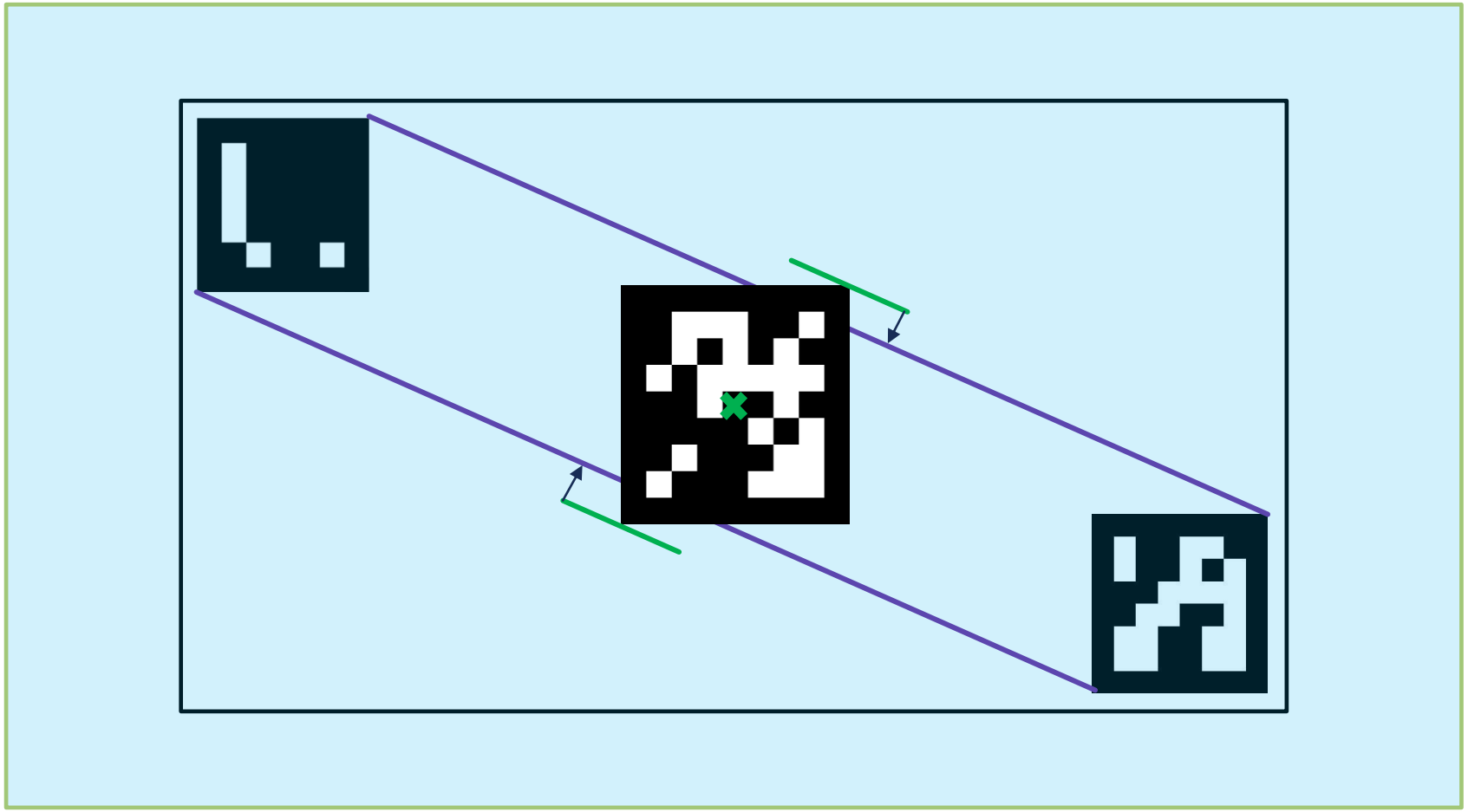


UPDATED DESIGN AND IMPLEMENTATION



UPDATED DESIGN AND IMPLEMENTATION

Field of View/Scaling



Key

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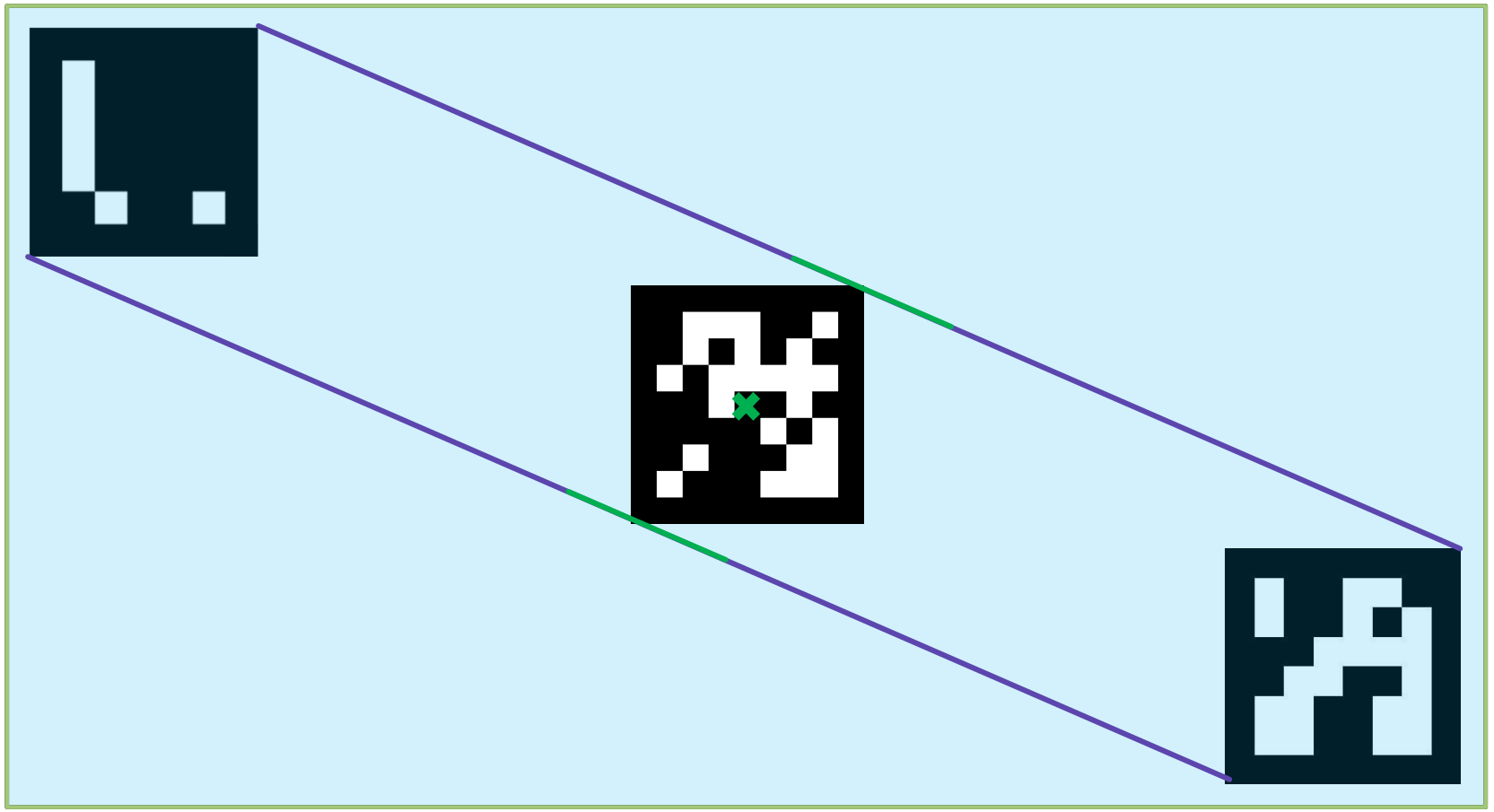
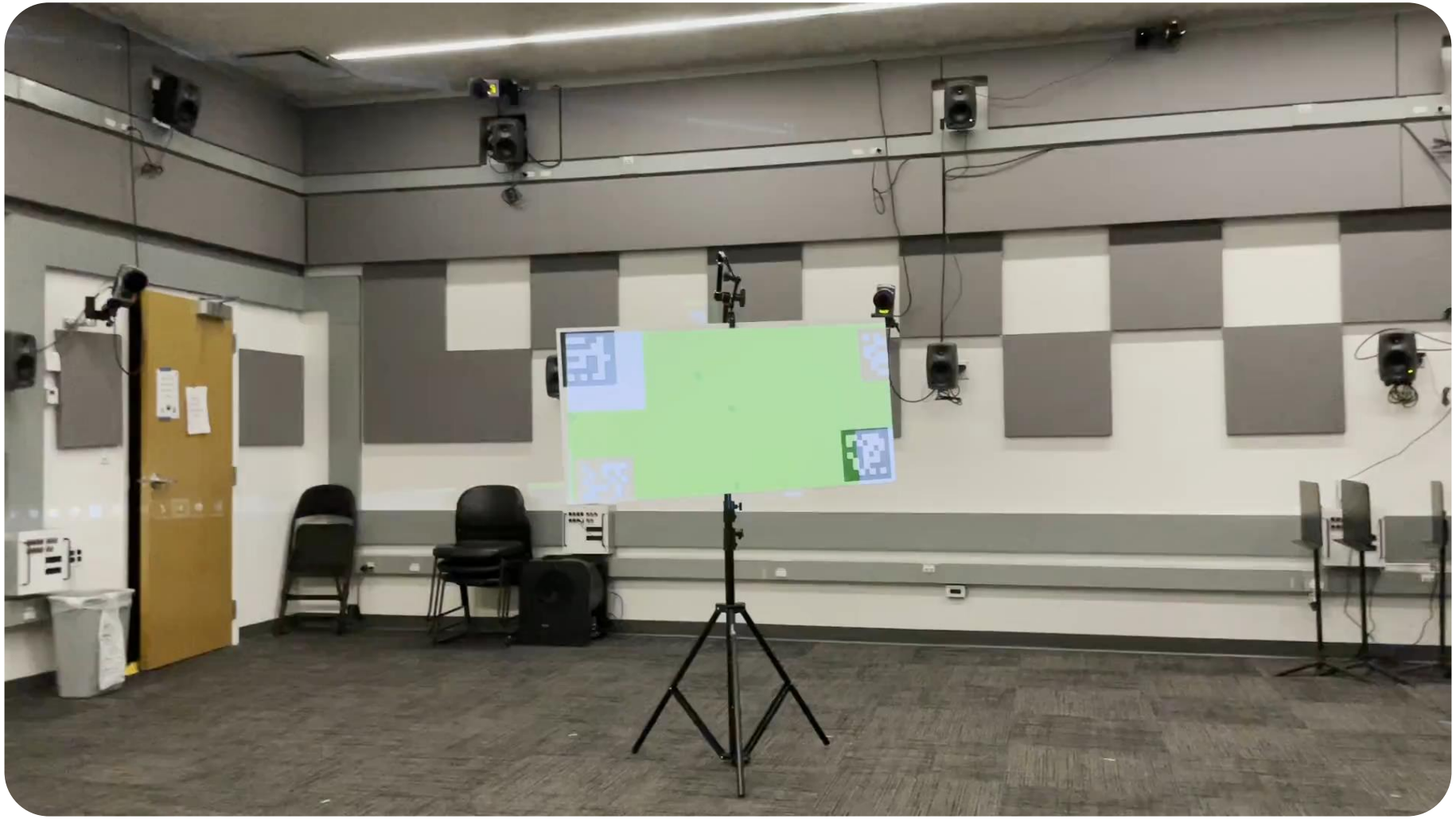
UPDATED DESIGN AND IMPLEMENTATION

Goal

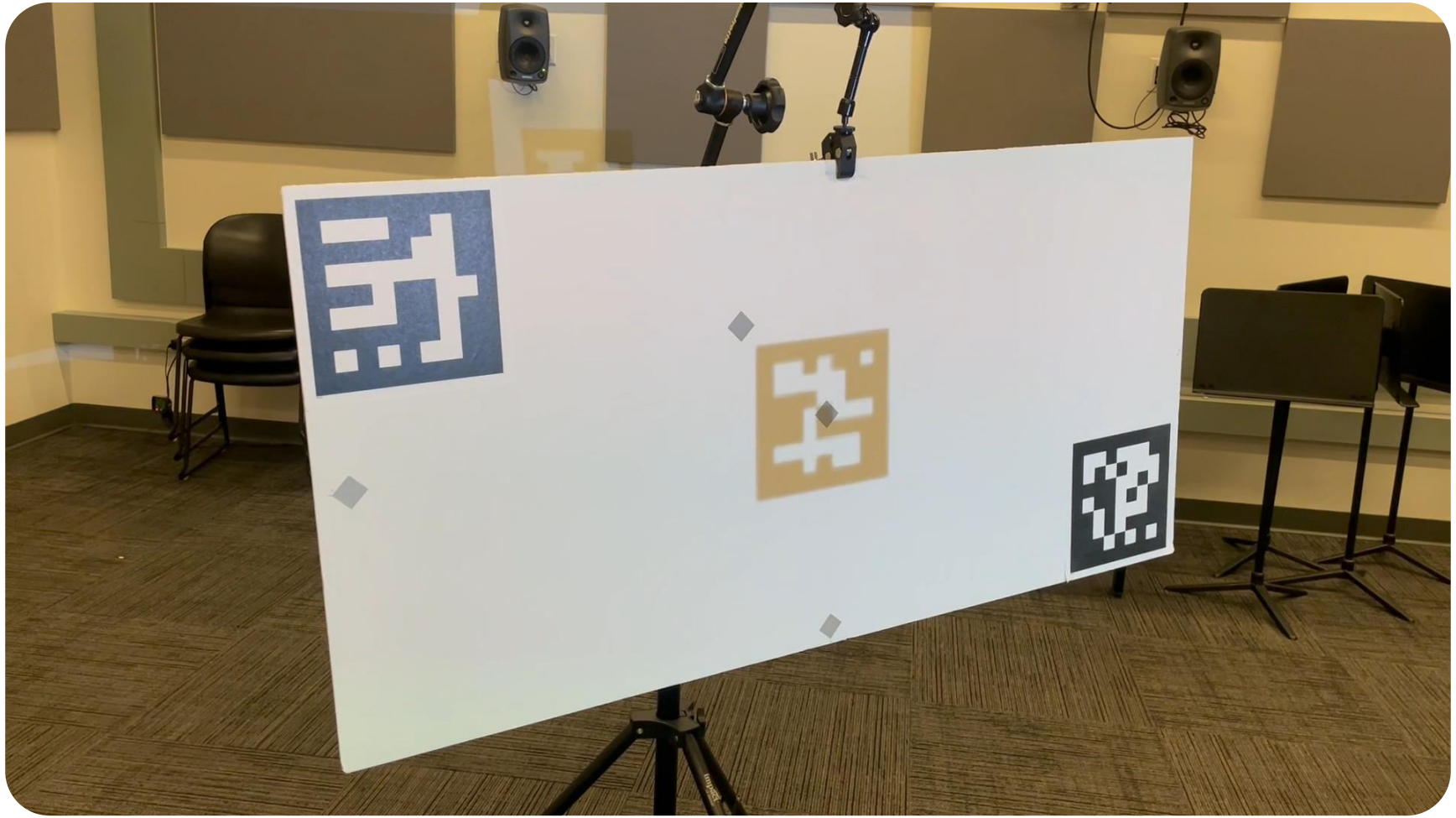


WORKING SYSTEM

WORKING SYSTEM

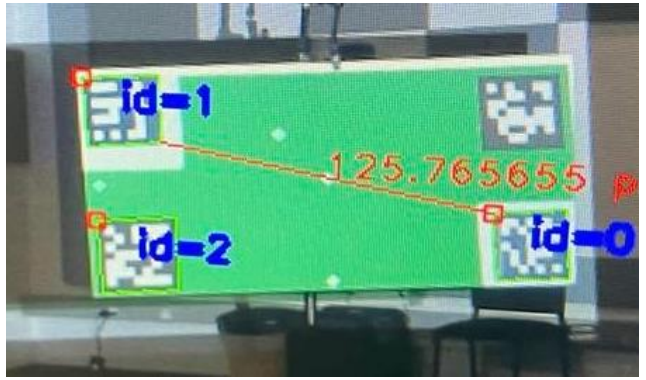


SYSTEM TESTING



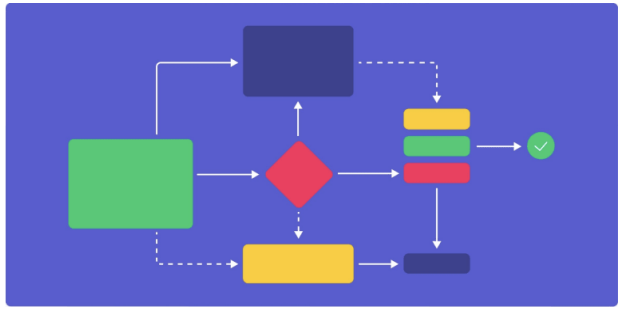
DELIVERABLES

Unity project



OpenCV
C++ marker
detection code

Qualisys project



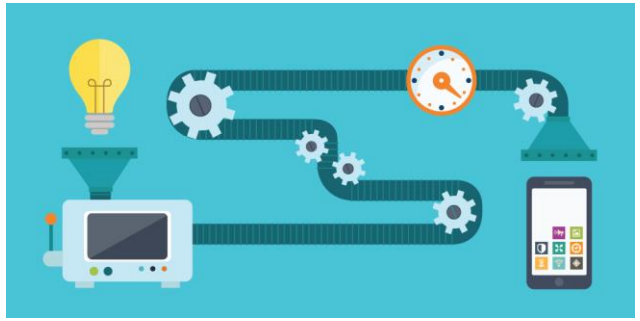
Diagrams and
documentation

Lessons Learned

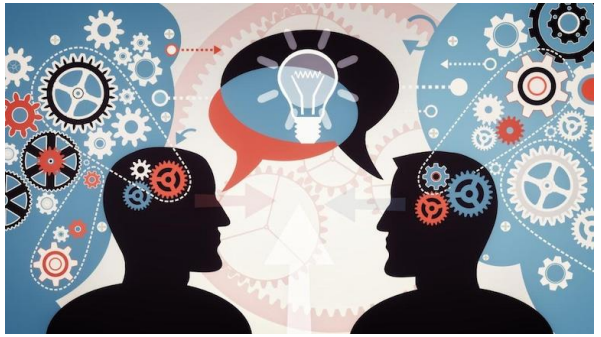
Future Work

REFLECTIONS AND FUTURE WORK

LESSONS LEARNED



Rapid Prototyping



Communicating with Client

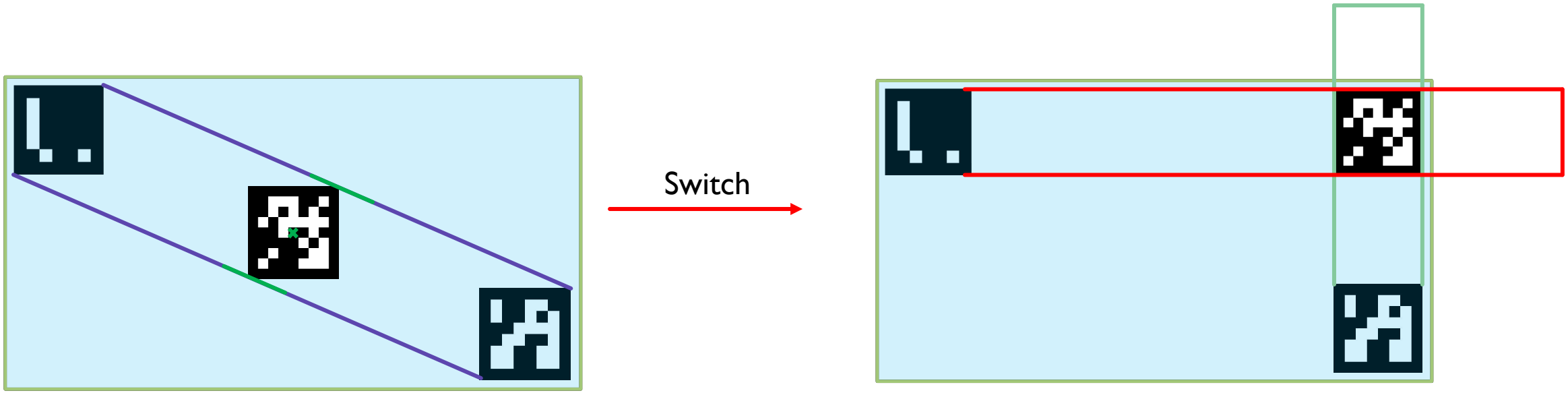
Documenting Steps

Reducing Team Roadblocks

FUTURE WORK

Two step calibration

1. Center with the scatter board
2. Scale and pan with projected calibration board



1. Scatter board

2. Projected calibration board

Acknowledgements

David Franusich,

Multimedia Designer,
Institute for Creativity,
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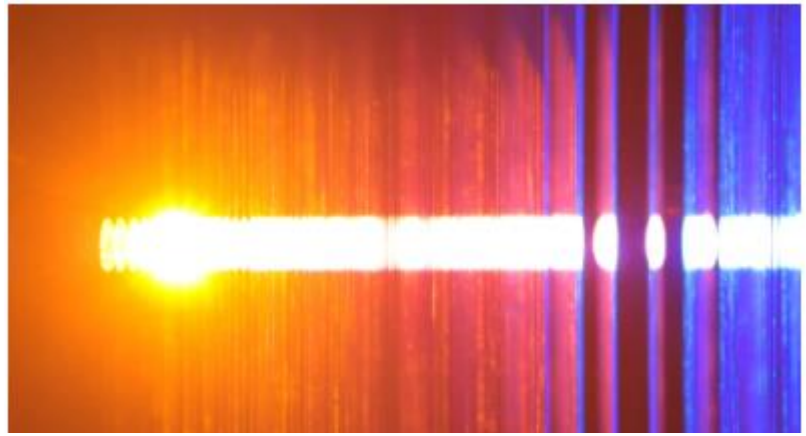

Acknowledgements

Professor Edward Fox,

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VIRGINIA TECH

Resources

Open CV documentation with Aruco markers
- https://docs.opencv.org/master/d5/dae/tutorial_aruco_detection.html

Why You Should Run Your Game Servers Separate From Your Chat | Joe Hanson | Apr. 4 2018
- https://www.pubnub.com/blog/why-you-should-run-your-game-servers-separate-from-your-chat/

Qualisys System Integration with Unity
- https://www.qualisys.com/software/integrations/unity/

Unity Camera Documentation
- https://docs.unity3d.com/Manual/class-Camera.html

Unity Package for OpenCV
- https://assetstore.unity.com/packages/tools/integration/opencv-plus-unity-85928

University of Tokyo Research
- https://www.youtube.com/watch?v=R586zXbgtA0

Lightform Calibration
- https://guide.lightform.com/hc/en-us/articles/360007699253-Visible-Structured-Light-Technology

QUESTIONS?