

Mobile Device Camera Connector (Tabiscope)

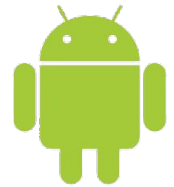
600.446 Computer Integrated Surgery II
Project 7

Daniel Ahn, Deepak Lingam, and Kyle Wong
Mentors: Dr. Amit Kochhar, Kevin Olds

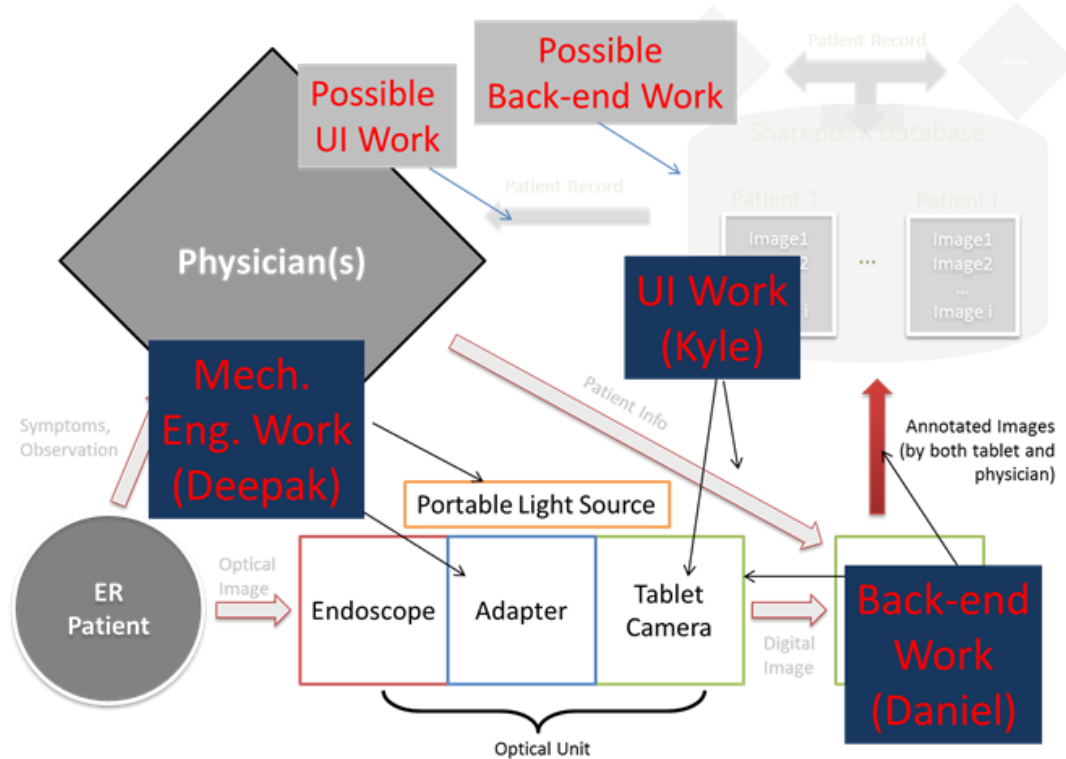


Project Overview

- Design a low cost endoscopic adapter
 - Needed for third world use where costs are major issues
 - Useful in emergency situations
 - Allows for rapid image sharing when doctors are not on site
- Create a system for Android devices
 - Current solutions only work with iPhones



Technical Summary

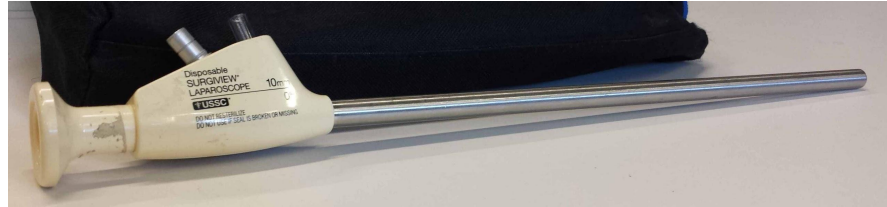


Dependencies

1) Android tablet with a high-resolution camera

- plan B: receive money to buy an Android tablet - proposal sent to Dr. Kochhar and Dr. Best

(Done)



2) functional endoscopes

- plan A: borrow old flexible endoscope - JH Outpatient Center

(Done for flexible scope)

- plan B: borrow an old rigid endoscope - obtained from Kevin Olds

(Done for rigid scope)

Dependencies Continued

3) Access to a machine shop or 3D printer for manufacturing an adapter

- plan A: Using the 3D printer in the DMC (**Done**)
- plan B: access/training to LCSR Machine Shop/JHU Mechanical Engineering (**If Needed**)
- plan C: machinist in the WSE Machine Shop to manufacture our design (**If Needed**)
- plan D: friends with access to machine shops to manufacture our design (**If Needed**)

4) Access to mentors

- weekly meetings with Kevin Olds (**Done**)
- email updates every two weeks (**Done**)

Original Deliverables

Minimum:

- Adapter for a Specific Android Tablet for an Endoscope **(Almost Done)**
- Android application: GUI / adjusting tablet's camera settings **(Done)**

Expected:

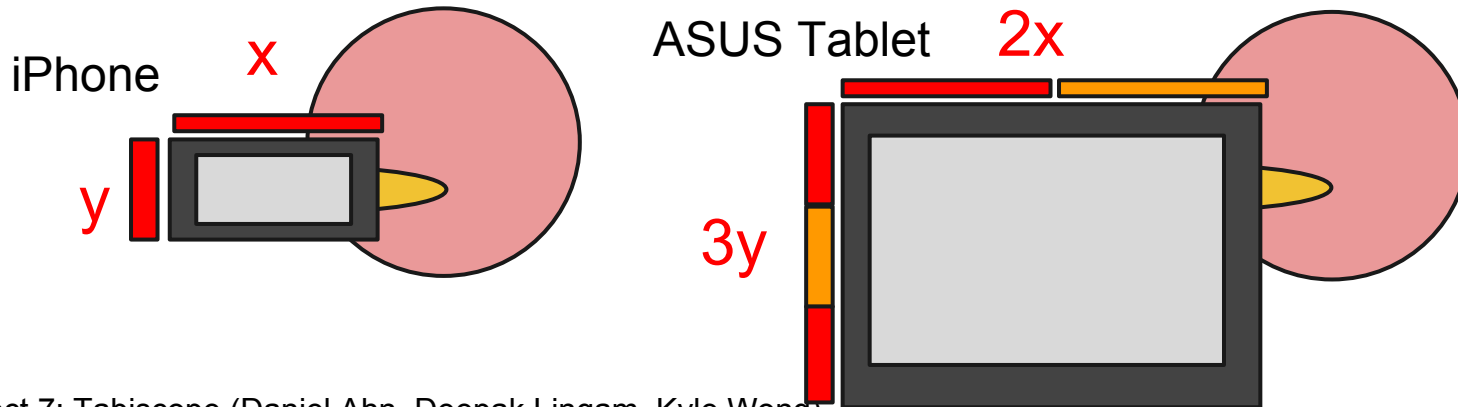
- Working Adapter with Ergonomic grip for easy holding and use **(In Progress)**
- Android app: GUI / organizing image data by patient identifier **(In Progress)**

Maximum:

- Universal Adapter for connecting any tablet to any endoscope
- Portable light source that ensures high quality images
- Android app: upload and secure viewing of patient endoscopy images

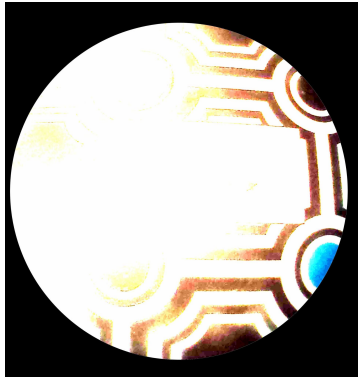
Design Change 1

- Use of an external camera instead of built-in camera (tablet bulkiness / weight / blindspot vs phone)
 - Mechanical: New adapter design for the external camera
 - Back-end: Need to edit Android kernel for the external camera



Design Change 2

- Real-time image processing method (auto-brightness and auto-focus) to prevent specular reflection
 - Back-end: OpenCV for Android, real-time image processing
 - Put into maximum deliverables



goal:
automatic



New Deliverables

Minimum:

- Adapter for a Specific Tablet **Camera** for Endoscope (**Almost Done**)
- Android app: GUI/**external camera images to tablet (In Progress)**



Expected:

- Updated Adapter with modifications for flaws found during testing
- Android app: GUI / label images (patient identifier) (**In Progress**)
- Real-time streaming **from external camera to tablet** (**In Progress**)

New Max Deliverables

Maximum:

- Universal Adapter for any Tablet Camera to any endoscope (unlikely)
- Portable light source that ensures high quality images (unlikely)
- Android application: upload and secure viewing of patient endoscopy images
- **Real-time image processing method to prevent specular reflection**

Minimum Deliverables: Camera Adapter

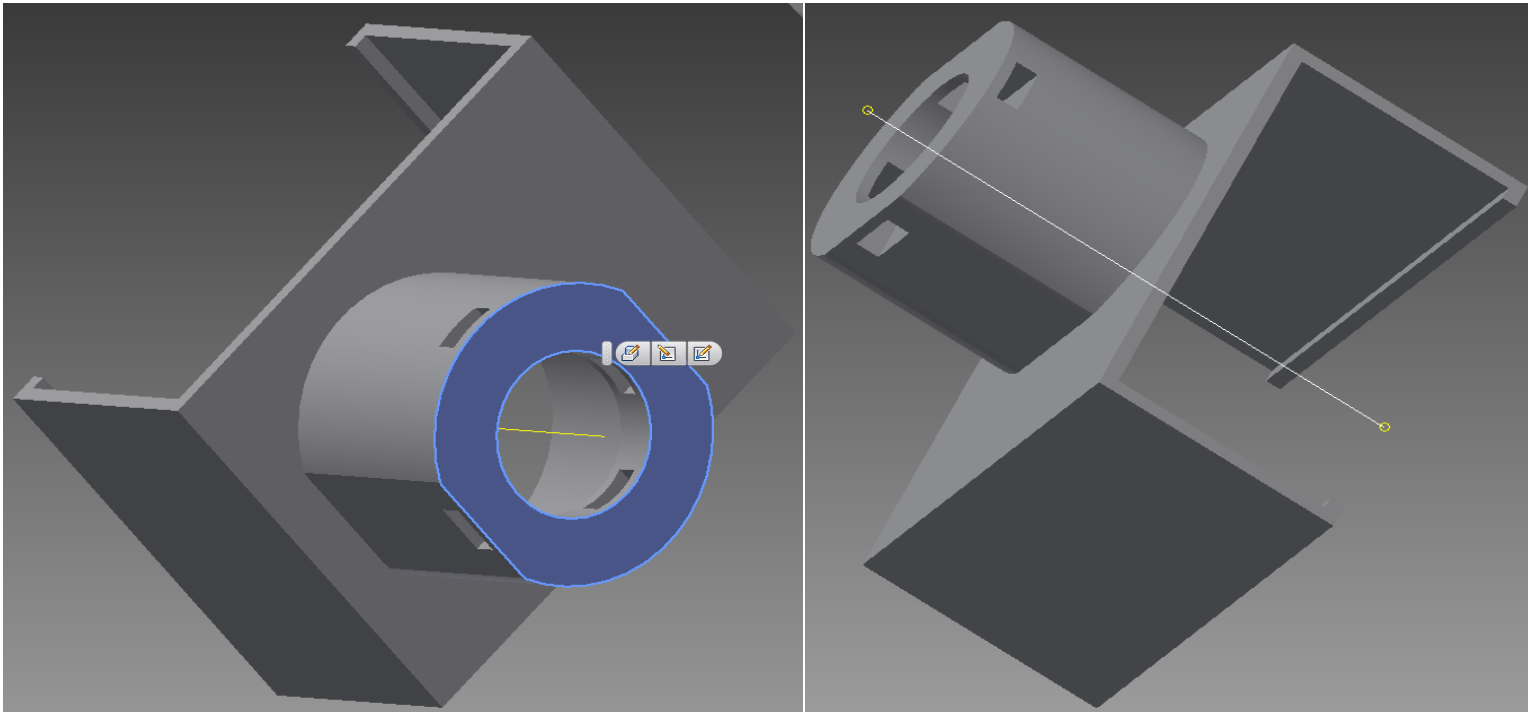
Minimum:

- **Adapter for a Specific Camera for Endoscope (Almost Done)**
- Android app: GUI/**external camera images to tablet (In Progress)**

Expected:

- Updated Adapter with modifications for flaws found during testing
- Android app: GUI / label images (patient identifier) **(In Progress)**
- Real-time streaming from external camera to tablet **(In Progress)**

Minimum Deliverable: External Camera Adapter



Project 7: Tabiscope (Daniel Ahn, Deepak Lingam, Kyle Wong)

Minimum Deliverables: App. (Camera Control and GUI)

Minimum:

- Adapter for a Specific Camera for Endoscope **(Almost Done)**
- Android app: GUI/**external camera images to tablet (In Progress)**

Expected:

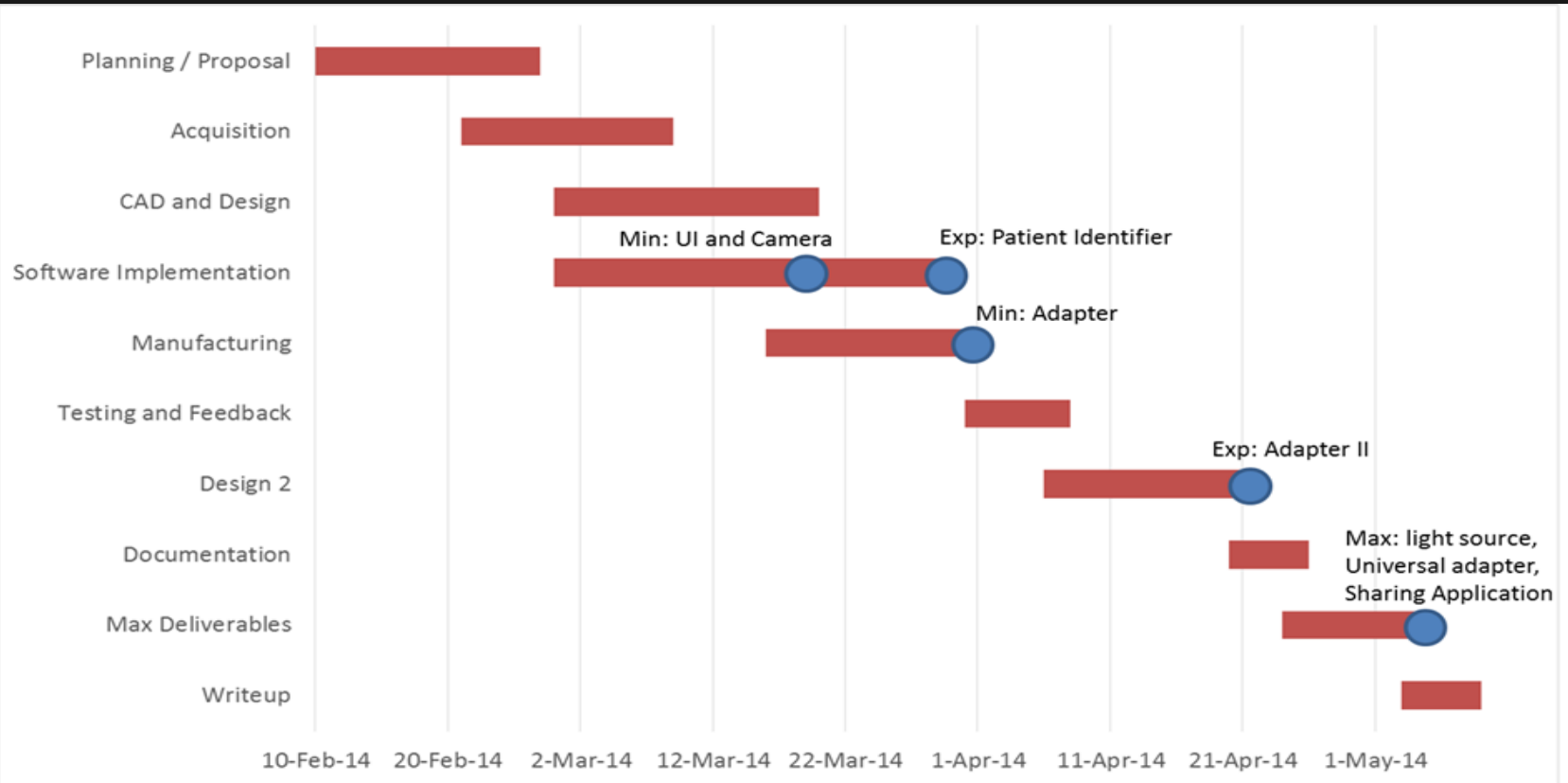
- Updated Adapter with modifications for flaws found during testing
- Android app: GUI / label images (patient identifier) **(In Progress)**
- Real-time streaming from external camera to tablet **(In Progress)**

Minimum Deliverables: App. (Camera Control and GUI)

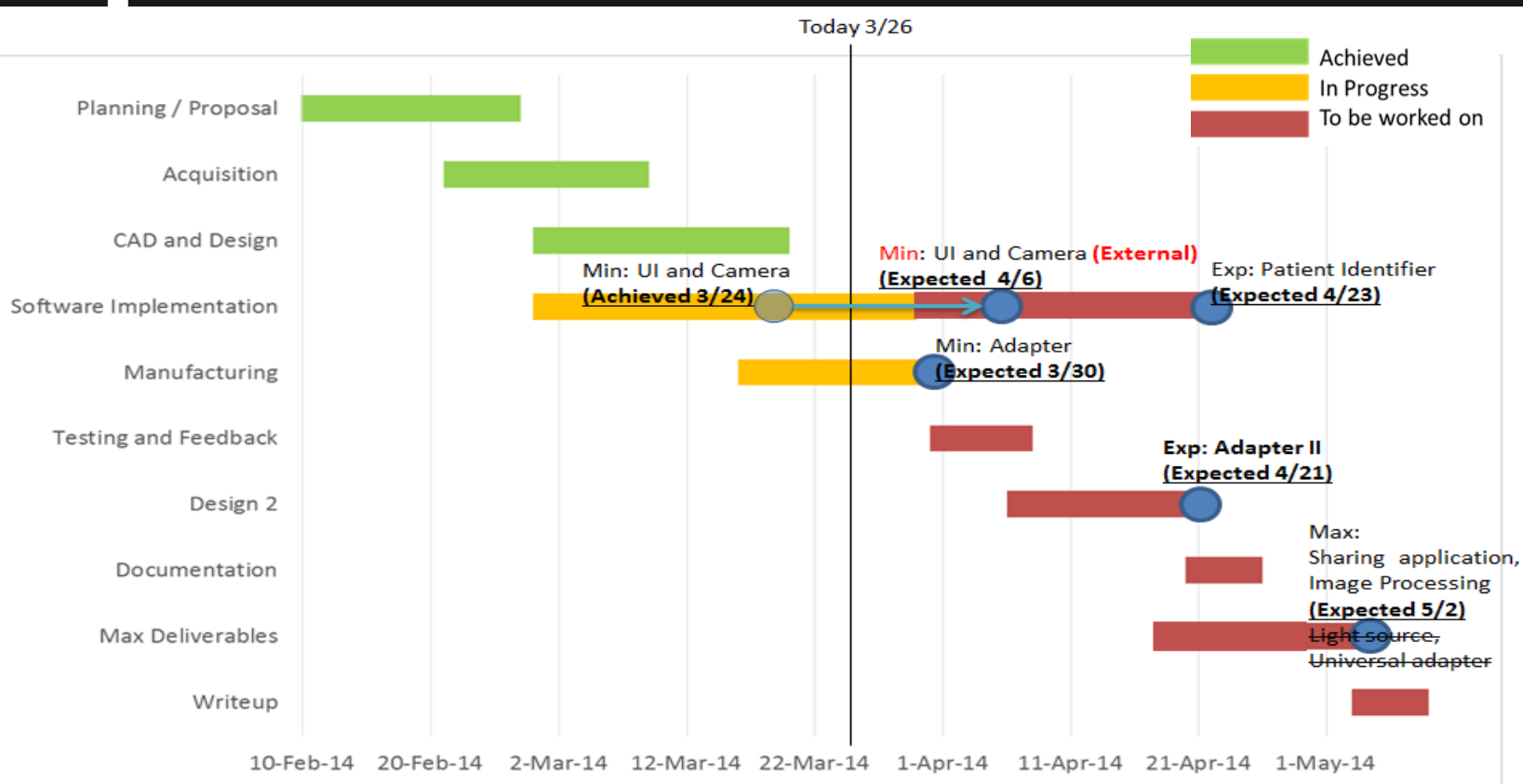


*test photos
generated by our
Tabiscope app and
a Laproscope

Original Schedule



Updated Schedule



Summary

About a week and a half behind schedule (design change)

- Unlikely to make external light source at current pace
- CAD work on the external adapter needs to get completed and sent for 3D printing
 - Should be done in a week
- An external camera might need to be obtained (currently, testing with USB host tablet adapter + webcam)

Questions and Feedback?

Deliverables Update

Original / Updated / Unlikely :

- Minimum: Adapter and App 3/30
- **Minimum: Camera Adapter and App 4/6**
- Expected: More Universal Adapter and Upgraded App 4/15
- **Expected: Upgrades, Camera to Tablet streaming 4/21**
- Max: Fully Universal Adapter, Light Source, Final App 5/2
- **Max: Universal Adapter, Final App, Image Processing 5/2**