

Mobile Device Camera Connector

600.446 Computer Integrated Surgery II
Project 7

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Mentors: Dr. Amit Kochhar, Kevin Olds



Background/Relevance

- Low cost solution
 - 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

Existing Solution

- Endoscope-I - iPhone



(Photo courtesy of
endoscope-i.com)

Proof of Concept

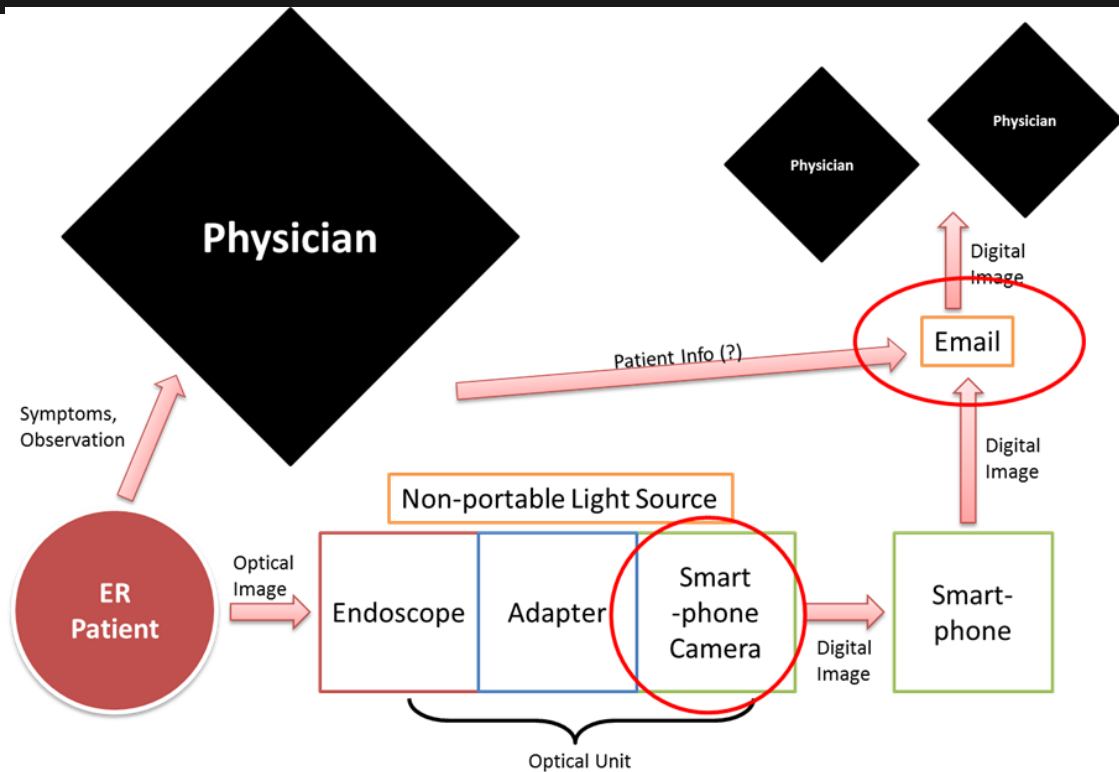


Proof of Concept

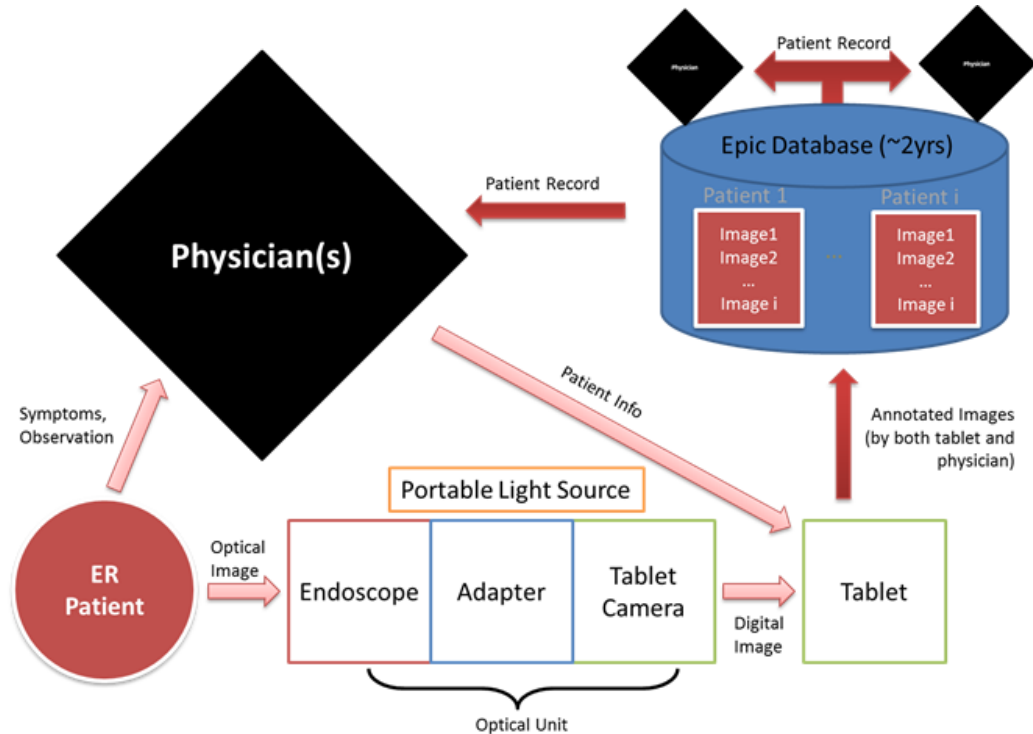


*Laproscope
test photos
using
Android
phone

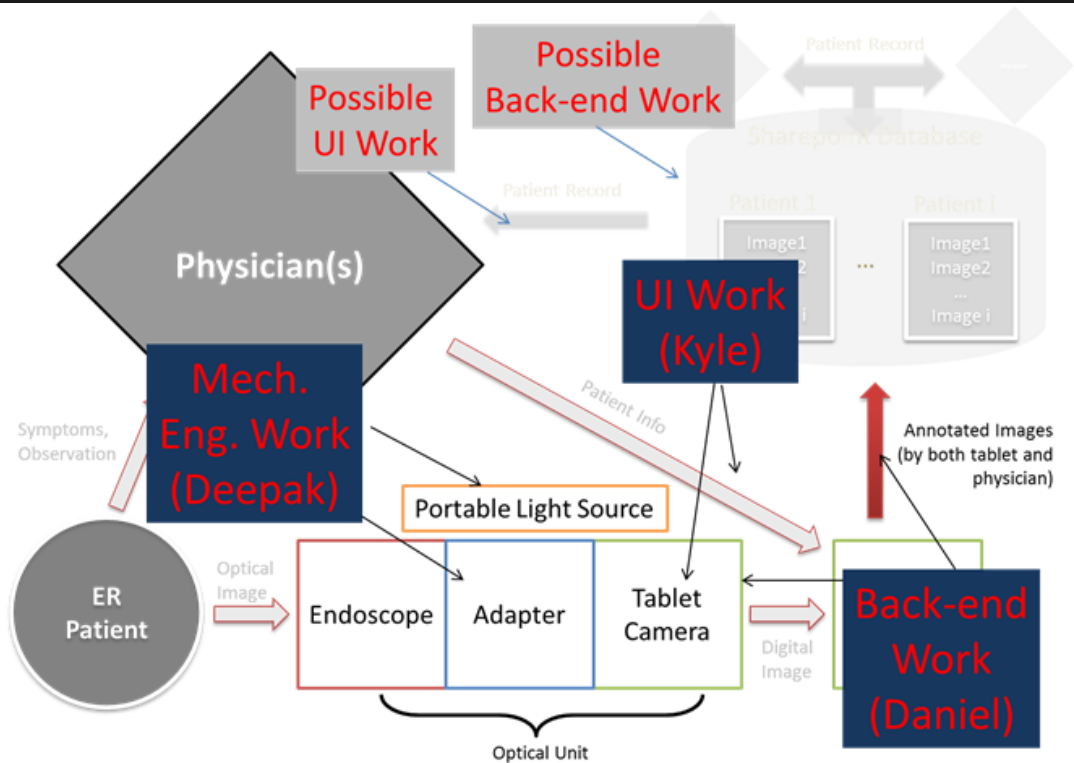
Technical Summary: Current Information Flow



Technical Summary: Future Information Flow



Technical Summary: Project Information Flow



Technical Summary

- **Mechanical Engineering:** Endoscope Adapter & Ergonomic Grip
 - CAD model
 - Optical lens design
 - Multiple prototype design
- **Software Engineering**
 - Front-end User Interface
 - Android IDE
 - User analysis & Storyboard
 - Back-end Database and Camera Interface
 - Android IDE
 - Sharepoint for Database (temporary)
- **Electrical Engineering:** Portable Light Source: TBD

Deliverables

Minimum:

- a working adapter for a specific Android Tablet for an endoscope
- Android application with GUI (Graphical User Interface) for adjusting tablet's camera settings and saving pictures to the device

Expected:

- a working adapter with ergonomic grip for easy holding
- Android application with GUI for organizing images by patient identifier

Maximum:

- a universal adapter for connecting any tablet to any endoscope
- a portable light source that ensures high quality images
- Android application that uploads and offers secure viewing of patient endoscopy images

Dependencies

1) Android tablet with a high-resolution camera

- plan A: borrow and use one from the Johns Hopkins Outpatient Center
- plan B: receive money to buy an Android tablet - follow-up on Dr. Kochhar and Dr. Best
(In Process)
- plan C: use personal Android phone for initial testing

2) A functional endoscope

- plan A: borrow or get an old endoscope from the Johns Hopkins Outpatient Center
(Done for flexible scope)
- plan B: borrow the old endoscope that Kevin Olds currently has
(Done for Rigid Scope)

Dependencies Continued

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

- plan A: get access/training to any of the JHU Mechanical Engineering/LCSR Machine Shop
- plan B: ask the machinist in the WSE Machine Shop to manufacture our design
- plan C: ask friends who have access to machine shops to manufacture our design
- plan D: have a highly detailed 3D CAD model of the adapter to be built that we can print using the 3D printer in the DMC

4) Access to mentors

- schedule weekly meetings with Kevin Olds (**Done**)
- schedule monthly meetings with Dr. Kochhar and Dr. Best
- send out email updates every two weeks
- get optics / lens advice from Dr. Kang (and other contacts through Kevin)

Management Plan

Meetings

- Weekly meeting with Kevin (Tuesday 2:45pm)
- Email updates with project progress to clinicians every two weeks
- Monthly meeting with clinicians, as needed

Assigned Responsibilities

- Deepak - CAD design for adapter / light source, manufacture
- Kyle - Android application GUI design
- Daniel - Android application Camera settings and storage

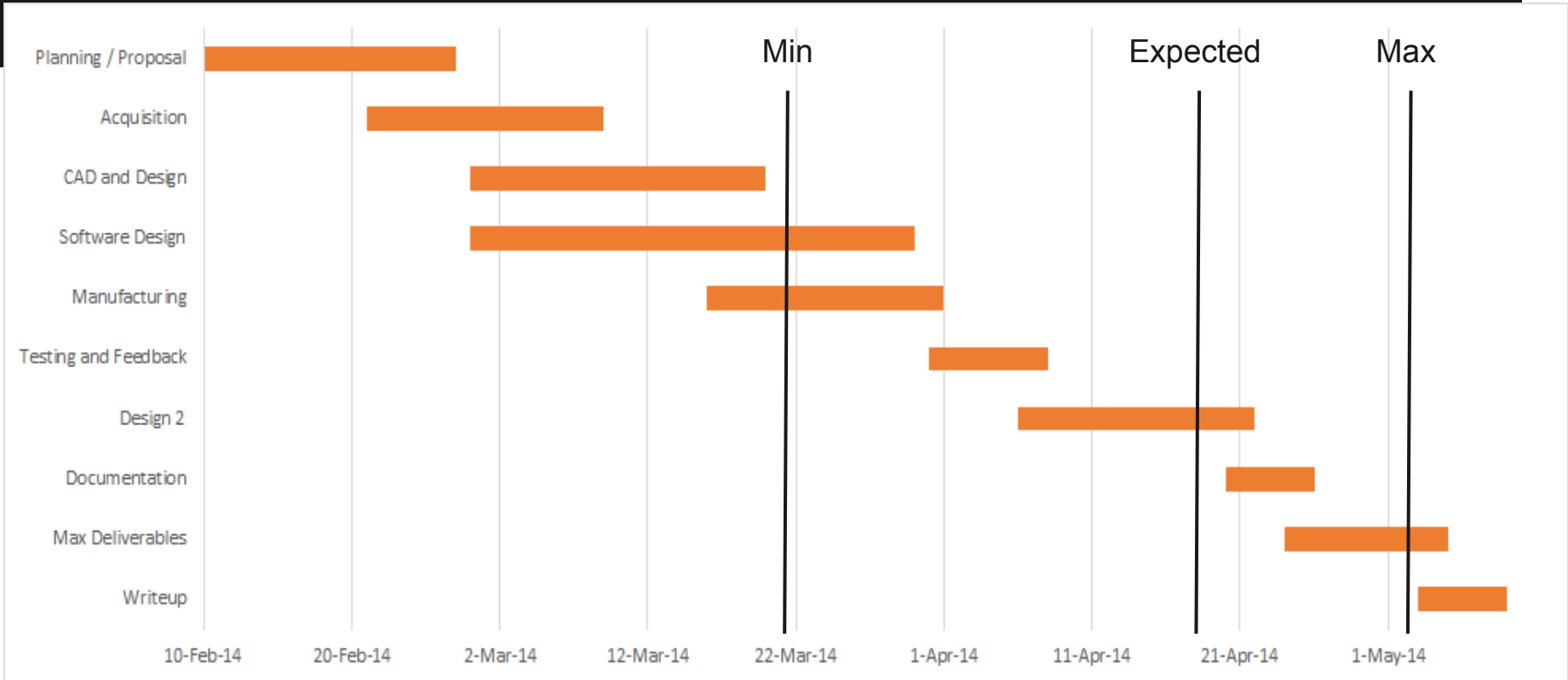
Management Plan

Budget - sent to Dr. Kochhar

- Asus Transformer Pad Infinity TF700--\$229.99
or Google Nexus 10--\$399.00
- Endoscope—Donated
- Light Source—Donated
- LEDs--\$29.95 to \$50
- Optics—TBD
- Switch-- \$0.43 to \$1.00
- Box-- \$20 to \$50
- machining / cad--TBD

Total: Roughly \$510.00

Key Dates/Milestones



Reading List

- Portable Light Source

Sznitman, Raphael, et al. "Active multispectral illumination and image fusion for retinal microsurgery." *Information Processing in Computer-Assisted Interventions*. Springer Berlin Heidelberg, 2010. 12-22.

Related Patents

Matsumoto, Seiji, Etsuo Nakano, and Suwao Sato. "Battery-powered light source arrangement for endoscope." U.S. Patent No. 6,260,994. 17 Jul. 2001.

Irion, Klaus. "Endoscope with LED illumination."

Shipp, John I. "LED illumination system for endoscopic cameras." U.S. Patent No. 6,449,006. 10 Sep. 2002.