Team Livermore

3D Simulation of Human Anatomy and Medical Conditions

D4: Team Final Project Presentation

Members:
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Lockett, Cheryl
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Link to Video of Presentation

- https://drive.google.com/open?id=1W_A9ExAJ2h300HqMVkQOfYCXfEg_77Mn

Table of Contents

Project Goals and Objectives

- Research
  - Address issues with patient understanding of medical condition after diagnosis.
  - Address issues with tool interoperability by using FHIR standard

- Functionality/Usability/Design
  - Personalized patient education.
  - Standards based patient modeling.
  - Implements the required functionality.
  - Simple to use interface, beautiful presentation.
  - Engaging educational materials.

- Innovation
  - Resource that can be launched by EMS and delivered to patients.
  - Interactive 3D presentation of liver in conjunction with educational materials.

Project Goals and Objectives

- Research
  - Address issues with patient understanding of medical condition after diagnosis.
    - The following authors enumerate issues and their solutions around patient medical understanding:
      - Yang, et. al. - The benefit of patient in terms of outcomes (Yang, 2018)
      - Ravindranath and Brenner, et. al. - The accessibility of patient education (Ravindranath M, 2013)
      - Dreeben - The availability of patient education (Dreeben, 2010)
  - Address issues with tool interoperability by using FHIR standard
    - Needed to facilitate ease of physician providing education to patient.
      - Farahani, et. al. - The difficulty of physicians of providing education - and the need to make it easy (Farahani, 2013)
      - Mandel, et. al. - Using standards to facilitate interoperability (Mandel, 2018)

Project Goals and Objectives

To achieve our project goals and objectives, Team Livermore completed:

- 3D modeling of 7 liver disease states using Blender
- Vetting and subsequent creation of FHIR server
- MySQL database design and creation
- Patient data, educational material creation, and database population
- WebUI design:
  - Python Flask integration
  - Three.js implementation

Team member contributions and Project Status

Task Name	Start	End	Duration (days)	Person Assigned
Project Deliverable 0	2/7/2018	2/11/2018	4	Team
Project Deliverable 1	2/12/2018	2/25/2018	13	Team
Develop prototypes	2/26/2018	3/4/2018	6	Team
Project Deliverable 2	2/26/2018	3/11/2018	13	Team
Vet HAPI server options and backup options and choose a technology.	3/5/2018	3/12/2018	7	Marcos/Rafay
Complete docker integration with prototype and test running on different system	3/12/2018	3/19/2018	7	Cheryl
Project Deliverable 3	3/12/2018	4/1/2018	20	Team
Develop educational materials for loading into database.	3/20/2018	3/27/2018	7	Jennifer
Develop framework (a base template) for developing the curriculum elements based on one of the liver diseases	3/20/2018	3/27/2018	7	Team
Develop Docker infrastructure for creating containers.	3/20/2018	3/27/2018	7	Cheryl
Develop code for sequencing container start up.	3/28/2018	4/5/2018	8	Cheryl
Develop working application framework for one disease	3/28/2018	4/5/2018	8	Team
Develop front end web page.	3/28/2018	4/5/2018	8	Andy/Marcos/Rafay
Develop threejs and 3D model integration with web page.	3/28/2018	4/5/2018	8	Andy
Develop patient data FHIR json files for patients.	3/28/2018	4/4/2018	7	Rafay
Develop MySQL database schema	3/28/2018	3/30/2018	2	Jennifer
Develop MySDQL datbase loading automation.	3/28/2018	4/5/2018	8	Jennifer/Cheryl
Find or develop textures for the organ 3D visualizations.	3/28/2018	4/5/2018	8	Team
Develop solution to issue with 3D models maintaining correct colors.	3/28/2018	4/5/2018	8	Andy
Develop Java connector to read FHIR data and write to db.	3/28/2018	4/4/2018	7	Marcos
Develop FHIR server data loading automation.	3/28/2018	4/4/2018	7	Cheryl
Develop flask, web page and db integration.	3/28/2018	4/5/2018	8	Jennifer/Cheryl
Project Deliverable 4	4/2/2018	4/22/2018	20	Jennifer
Project Deliverable 5	4/2/2018	4/22/2018	20	Team
Normalize all of the models to be consistent	4/5/2018	4/12/2018	7	Andy
Complete interactive tutorials for 3-5 diseases.	4/13/2018	4/20/2018	7	Team
Complete user acceptace testing.	4/21/2018	4/22/2018	1	Team
Complete presentations(s).	4/21/2018	4/22/2018	1	Team

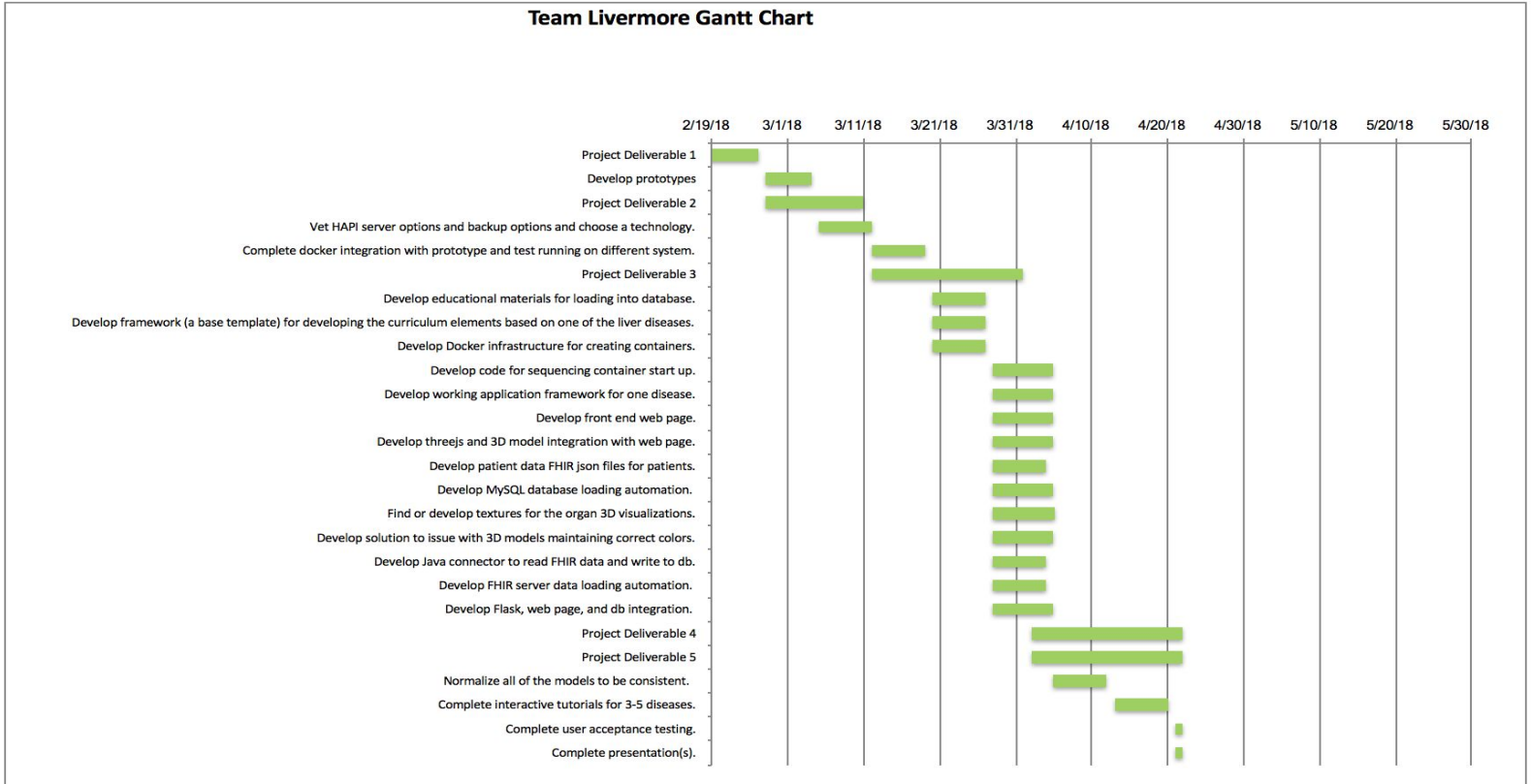
KEY

Green = Complete

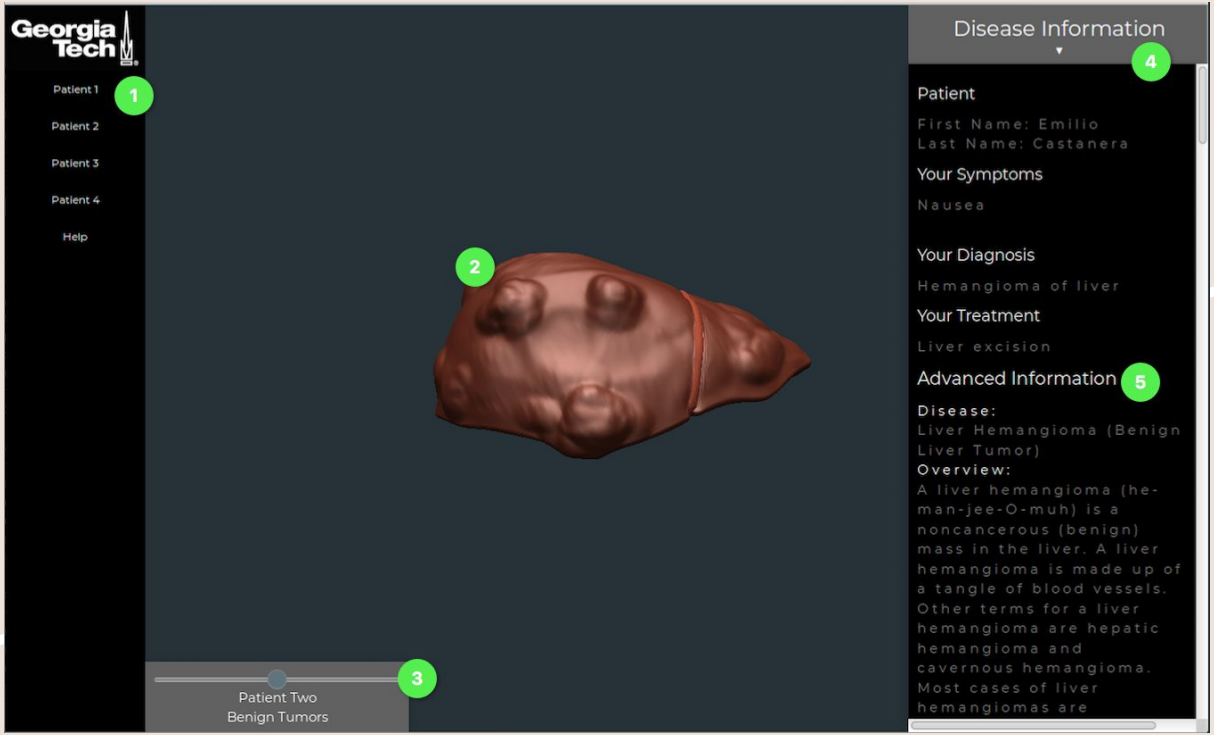
Yellow = In Progress

Red = Not Started

GANTT Chart

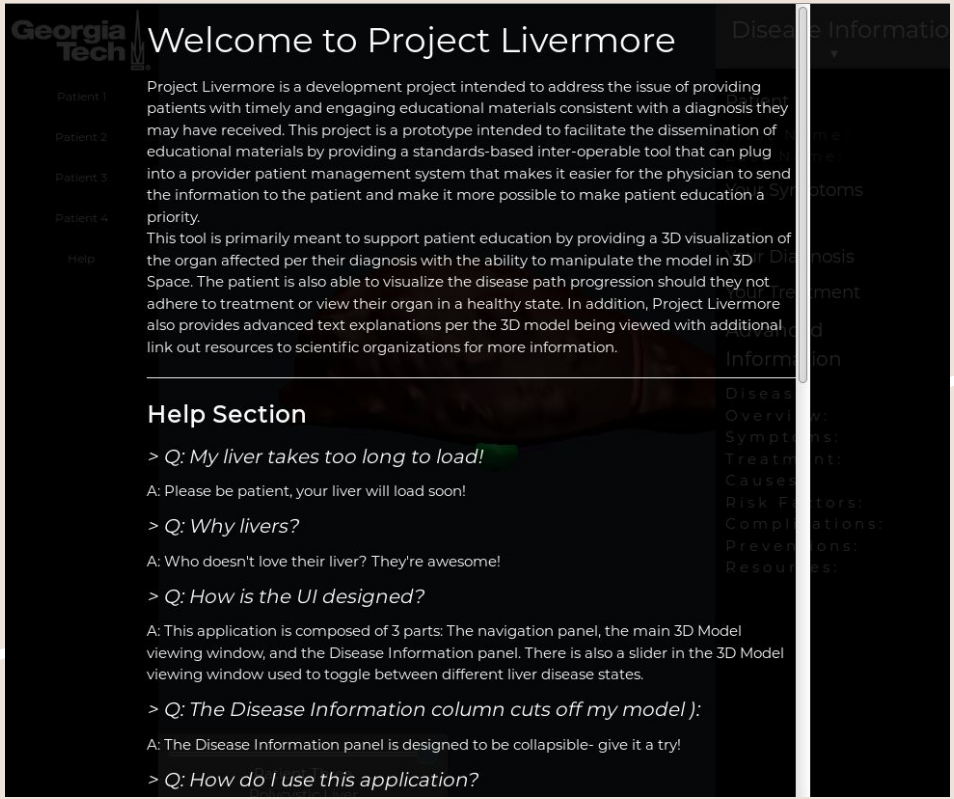

Team Livermore Gantt Chart
2/19/18
3/1/18
3/11/18
3/21/18
3/31/18
4/10/18
4/20/18
4/30/18
5/10/18
5/20/18
5/30/18
Project Deliverable 1
Develop prototypes
Project Deliverable 2
Vet HAPI server options and backup options and choose a technology.
Complete docker integration with prototype and test running on different system.
Project Deliverable 3
Develop educational materials for loading into database.
Develop framework (a base template) for developing the curriculum elements based on one of the liver diseases.
Develop Docker infrastructure for creating containers.
Develop code for sequencing container start up.
Develop working application framework for one disease.
Develop front end web page.
Develop threejs and 3D model integration with web page.
Develop patient data FHIR json files for patients.
Develop MySQL database loading automation.
Find or develop textures for the organ 3D visualizations.
Develop solution to issue with 3D models maintaining correct colors.
Develop Java connector to read FHIR data and write to db.
Develop FHIR server data loading automation.
Develop Flask, web page, and db integration.
Project Deliverable 4
Project Deliverable 5
Normalize all of the models to be consistent.
Complete interactive tutorials for 3-5 diseases.
Complete user acceptance testing.
Complete presentation(s).

Project Successes and Unique Elements: WebUI

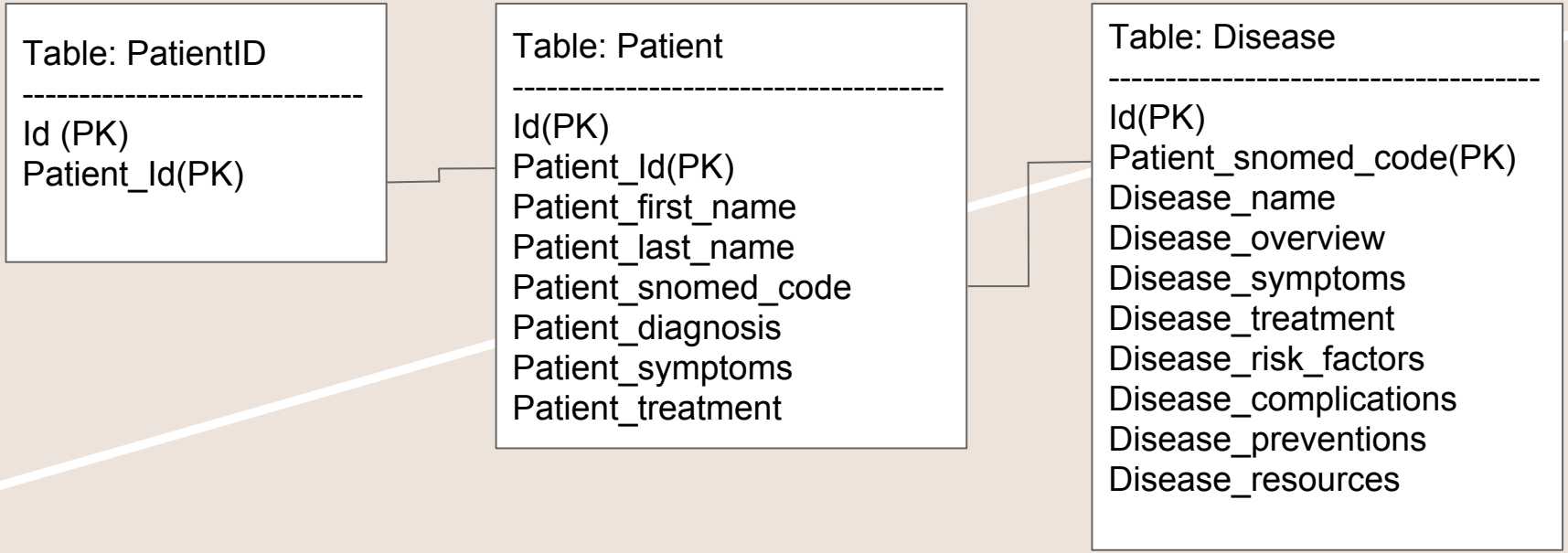


1. Patient navigation pane
2. 3D Model viewing window
3. 3D Model slider
4. Disease Information
5. Advanced Information

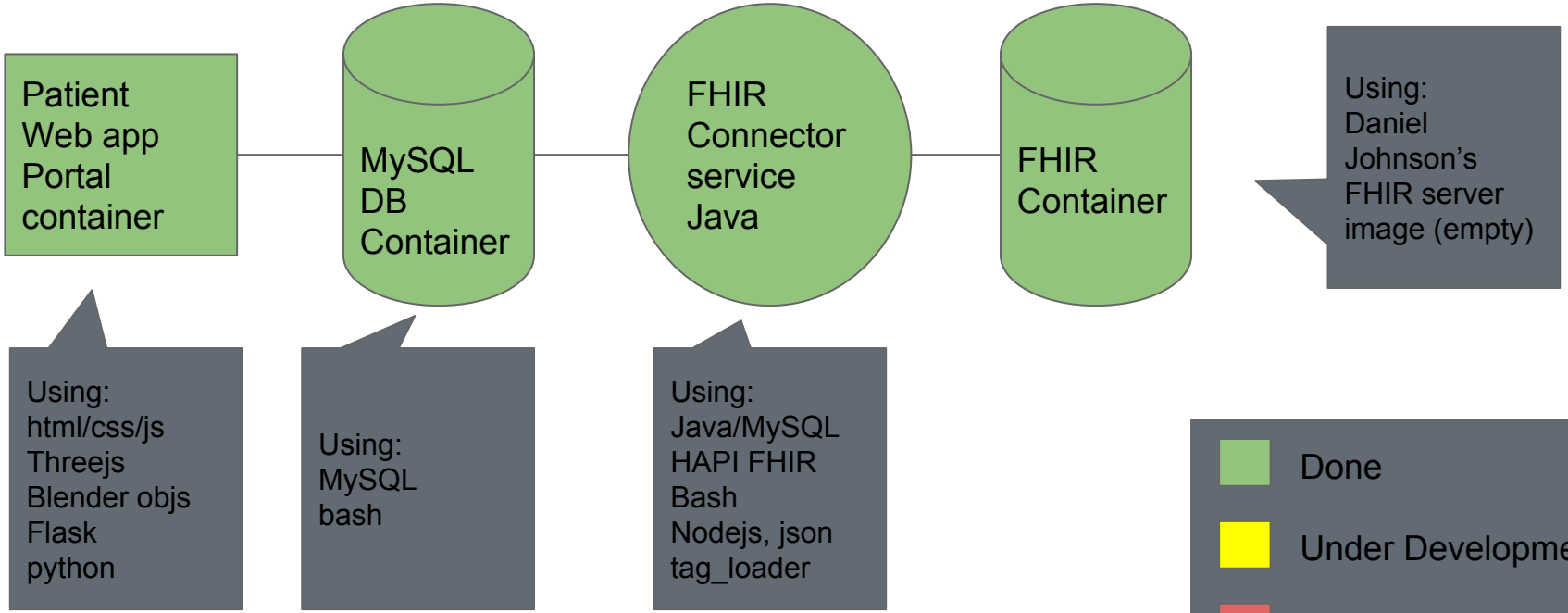
Project Successes and Unique Elements: WebUI – Help Page



Project Successes and Unique Elements: MySQL Database



Architecture



Issues Addressed by the Application

- Address issues with patient understanding of medical condition after diagnosis.
  - The benefit of patient in terms of outcomes
    - ⇒ Patient receives review of diagnosis and treatment plan.
  - The accessibility of patient education
    - ⇒ Patient can access information any time.
  - The availability of patient education
    - ⇒ Patient provided personalized educational information.

- Address issues with tool interoperability by using FHIR standard
  - Needed to facilitate ease of physician providing education to patient.
    - The difficulty of physicians of providing education - and the need to make it easy
      - ⇒ Physician EMS may launch application
    - Using standards to facilitate interoperability
      - ⇒ Physician EMS may use FHIR and CDS hooks to share information with patient

Project Future Plans and Opportunities

- Many more organs and diseases to model!
- Ability to hook up directly to an EHR service as an application that can be rendered on hand at doctor appointments.
  - CDS Hooks
- Additional technology integrations
- General application improvements
  - Performance enhancements, beautification, etc.
- General education improvements
  - Quizzes, labeling, etc.

References

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- Farahani, M., Mohammadi, E., Mohammadi, N. (2013). Factors influencing the patient education: A qualitative research. Retrieved February 11, 2018 from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3748569/
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