

Score Sheet. 600.455/655 Homework #1 - Fall 2021

Name: _____ ; Email: _____

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- 1. (30 points)
 - A. (5 points) _____
 - B. (10 Points) _____
 - C. (15 points) _____
- 2. (50 points)
 - A. (20 points) _____
 - B. (20 points) _____
 - C. (10 points) _____
- 3. (20 points)
 - A. (10 points) _____
 - B. (5 points) _____
 - C. (5 points) _____
- TOTAL (100 points) _____

I/we worked alone on this assignment and followed all other guidelines:

signature date

signature date



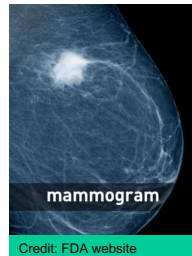
Scenario

Mammography is the current breast cancer screening tool world-wide. Early detection and treatment of breast cancer can result in reduced mortality. Typically, women aged 40 and older should get a mammography screening test every year, resulting in roughly 40 millions exams done every year in the US. Unfortunately, this screening method has sensitivity limitations, and roughly 15% of patients asked to come for a second visit to perform additional mammography and ultrasound exams.



Credit: MD Anderson Cancer website

In this assignment, you will be asked to analyze this clinical procedure. In addition to the reference materials provided on the course web site and the lecture material, you are encouraged to use other external references from the web or library. However, you should cite any materials that you use.



Credit: FDA website

RECOMMENDED REFERENCES

- https://www.cdc.gov/cancer/breast/basic_info/screening.htm
- Buist DS, Porter PL, Lehman C, Taplin SH, White E (2004) Factors contributing to mammography failure in women aged 40-49 years. J Natl Cancer Inst 96(19):1432-1440
- Berg WA, Blume JD, Cormack JB et al (2008) Combined screening with ultrasound and mammography vs mammography alone in women at elevated risk of breast cancer. JAMA 299(18):2151- 2163



Question 1 – Analysis of existing procedure

- A. Describe the most common clinical screening procedure for breast cancer. What is the clinical problem? How screening prevents this problem? Briefly, how is it done now?
- B. Develop an outline for evaluating this screening procedure, including such factors as “cost”, “safety”, “effectiveness”, “accuracy”, “time”, etc. For each such criterion, include:
 - Short definition or explanation of the criterion
 - Short discussion of how that criterion should be assessed (e.g., units of measure, means of gathering information)
 - Short discussion of how important each criterion is to each relevant group affected (patient, clinician, hospital administrator, insurance company, employer, etc.)
- C. Use this outline to evaluate the existing method using these criteria



Question 2 – Identifying alternatives

- A. Sketch an alternative approach using computer assistance to enhance this procedure. Do not write a book. I am looking for 1-2 pages maximum, possibly with a sketch or two.
- B. Sketch a second, distinct approach using computer assistance, with the same sort of information and discussion included in Part 2.A.
- C. Develop an outline evaluating the two approaches using the criteria developed in Question 1. Your analysis should compare your approaches to each other and to existing manual practice.

NOTE: Your alternatives may either involve significant improvements to existing methods and systems, or may suggest other, possibly robotic, systems and methods.



Question 3 – Fleshing out the preferred embodiment

- A. Based upon your analysis in Question 2, select one of your proposed system solutions for further design evaluation. For this design, provide an additional 2-3 pages total (discussion + sketches) outlining the technical approach. Your discussion should clearly define
- Preoperative, intraoperative, and postoperative information needed.
 - How this information will be obtained.
 - Important components and human interfaces.
 - Key coordinate systems and their relationship to each other
 - What components need to be developed.
 - What components (if any) need to be “invented”
- B. Summarize the step-by-step procedural flow for your solution. What will the clinician or other members of the team do at each step? What information will be needed at each step? How will this be obtained?
- C. Discuss the steps, timeline, and estimated resource requirements to implement your solution for clinical use



Important NOTE

- There is no single “right” answer to these questions, and I am well aware that people may not have either the experience or the knowledge to make highly credible estimates of things like schedules and costs. The purpose of the exercise is to get you to think.
- In grading the answers, we will be looking more at your reasoning and your approach to the problem than at the specific “correctness” of any technical solutions you come up with.
- At the same time, do try to keep sight of the specific goals of the application, and don’t simply resort to science fiction. An answer proposing well trained termites is not likely to score very well.

