

**UNIVERSITY OF NOTRE DAME**  
**DEPARTMENT OF AEROSPACE AND MECHANICAL ENGINEERING**  
AME30362: Design Methodology, Fall 2009

**P2 – Product assessment project**  
**Project Due Date: Tues. Sept. 22, 2009**

During this project you will gain important hands-on experience with an existing product as the next step in developing design specifications for a new-generation product. You will be given used (some used very hard!) products and will disassemble them. This project will provide you the chance to develop component diagrams for the products, evaluate the quality of their parts and subsystems, determine how they were assembled and finally to identify strengths and weaknesses of the designs.

**Project Description:**

The products you will be evaluating are the players from the first-generation mechatronic football game. Your group will nominally be provided with two players, one from each of the two squads, as well as a place to work and basic hand tools.

The disassembly process is intended to serve multiple purposes. First it will allow you to work directly with these devices and explore how they were fabricated and assembled and the quality of the parts and the assembly process. It will allow you to recover and evaluate components that may be used to fabricate the next generation players.

Project groups of 10-11 students will be assigned by lottery and provided with two first-generation robots, one from each squad so two different basic design concepts can be examined. These robots are nominally inoperative and some have already had some parts removed thus you are only expected to assess what you are provided and some of the products may be incomplete but should still provide a variety of issues to consider.

It is imperative that you attempt to disassemble the machines in a manner that will maintain the integrity and function of as many of the outsourced components (motors, wheels, bearing, electronic elements, etc.) as possible. If questions arise as to how best to extract a component, you should ask the supervising TA.

**Project Requirements:**

Each project group will prepare a plan to conduct the project, assign responsibilities to individuals in the group, implement the plan and document both the planning and results of the project.

1. Each group will completely disassemble both robots using hand-tools in B-19 and document the disassembly process in the manner they deem most appropriate. All of the work with the robots will take place in B-19 and no tools or components should be removed from the Design Studio. You should NOT disassemble the tackle sensors/bumpers nor remove any components from printed circuit boards. Information on access to B-19 and tool usage will be provided by the project's TA coordinator.

2. Each group will prepare a formal engineering report to document the project that will include:
  - a. A no-more-than 1-page Executive Summary of key findings.
  - b. A stand-alone section that provides a qualitative assessment of the design of **each** robot including:
    - i. Photographic record of the disassembly process
    - ii. Quality of parts fabrication
    - iii. Suitability of outsourced components for this application
    - iv. Quality of assembly
    - v. Suitability of the design for maintenance and repair
    - vi. Overall quality of fabrication and assembly of the robot
  - c. Comparison of the relative merits of the two robots including:
    - i. "15" key strong points for each design with specific rationale
    - ii. "15" key weak points for each design with specific rationale
  - d. A part decomposition concept map for one of the two robots
  - e. A complete bill of materials (BOM) for each robot that includes every part – both outsourced and fabricated in-house. The BOM should be in tabular form and include at least:
    - i. For all in-house fabricated parts
      1. A brief description/identifier/name
      2. Materials used to fabricate the part
      3. Your guess for the fabrication process and time to fabricate
    - ii. For all out-sourced parts
      1. Model numbers and source if you can determine this information from the part – if not a brief description/identifier
      2. Cost estimate for this component or a comparable component.

The format and length of the report is at your discretion. The report should be submitted in hard-copy in class and electronically in .pdf form.

3. **PRIOR** to the actual work on the robot, each group must submit a 1-page memorandum that concisely summarizes the group's plan for the disassembly task and indicates individual roles and responsibilities for the project. This memo should be no more than 1-page in length and also be included as an appendix in the project report.
4. Each group will prepare a 2-slide power point presentation to document their key observations from the project. The presentation will be submitted in hard copy in class and electronically as a .pdf file. This presentation is not intended to be a description of the game or of potential mechatronic player designs – the purpose is to identify and prioritize the critical important features of the first generation products (players) that you disassembled. Some of the project groups will be asked to present their results to the entire class during the semester.

**Project TA Coordinator:**

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