

# Senior Design I

## Initial Project and Group Identification Document

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### **“No Touch” Chess Board**

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#### ***Possible Sponsors:***

SoarTech

## Motivation, Goals and Objectives

The motivation for this project comes from wanting a fun, stimulating project that is challenging and purposeful at the same time. All group members like the concept of a “no touch” (or “wizards”) chess, since it contains both significant hardware and AI components.

The concept for “no touch” chess comes from the J.K. Rowling book and Warner Brothers’ movie, Harry Potter and the Sorcerer’s Stone. In the movie, the wizards tell the pieces where they want them to move and the pieces move themselves to that location without any physical interaction from a human. The pieces also capture other pieces in the game, and the captured pieces are then removed from the board. Also in “wizards” chess (as it is called in the book), a player is allowed to either play against another player, or against an AI of some kind (in the movie, the pieces are somewhat sentient, so they can play themselves, but for our purposes, they would be computer controlled).

The finished project should be only slightly bigger than a regular sized chess board, and the weight should be low enough that the project could be portable. The cost should be as cheap as possible, but is not a significant factor.

## Specifications and Requirements

Some specifications and requirements of the project include:

- At least two modes of play including:
  - Player VS. Player
  - Player VS. AI
- Voice Recognition for at least two different human voices
- Ability to do route management for the pieces as each piece moves differently
- Ability to remember routes for 6 different pieces and identify incorrect moves
- Use of electromagnets and permanent magnets to get pieces to move without human interaction – pieces may be as much as 0.25 pounds.
- The AI response for a Player VS. AI game should take no more than 5 seconds.
- Ability to possibly use chess pieces as “fairy” chess pieces

### **Hardware Specifications:**

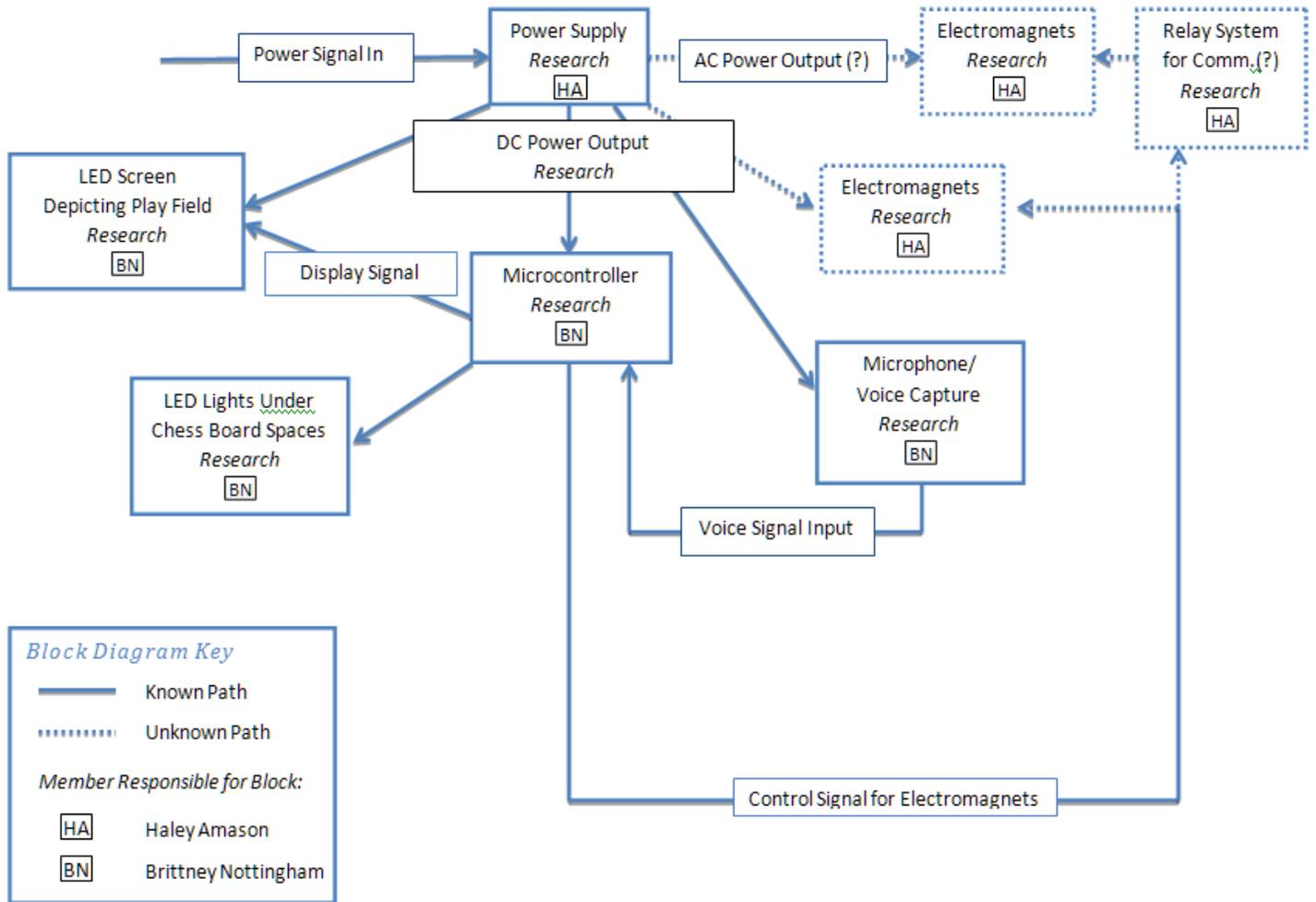
- Board will be 20” x 20” X 5” or less
- Board material must allow for significant enough flow of EM waves for pieces to move OR have centers of spaces cut out for magnet placement
- LCD Screen depicting current play field

### **Software Specifications:**

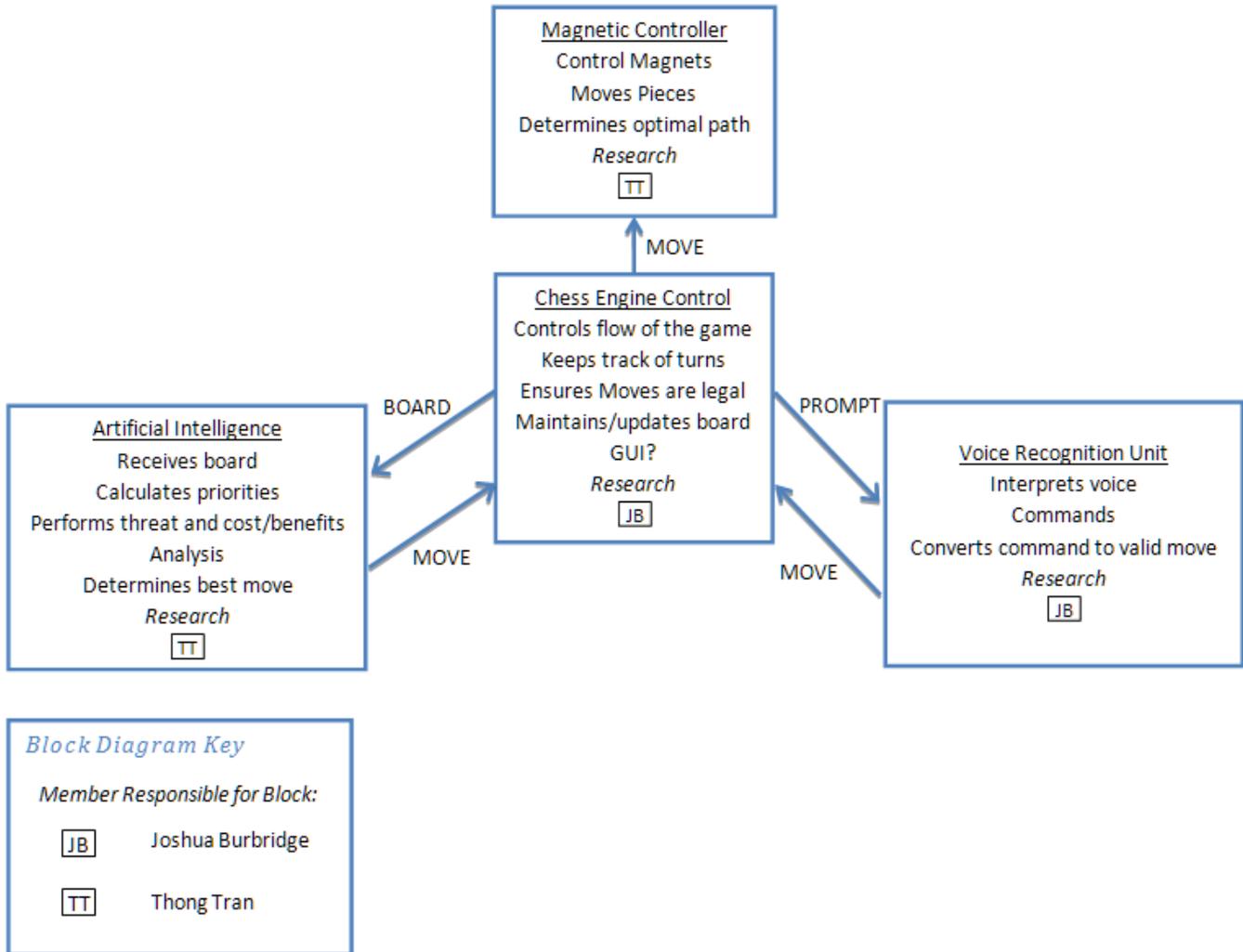
- Chess Engine must have reasonable response time; most moves by the AI should take less than 5 seconds to compute.
- Speech recognition module must be able to interpret commands quickly. This should take 3 seconds or less to avoid confusion and/or repeated commands.
  - The software must have efficient algorithm design. It should run in at least polynomial time, with search algorithms running in  $O(n \log n)$  or better.
- The AI unit will have 3 difficulty levels: Easy, Medium, and Hard, with additional look-ahead capabilities with increasing difficulty level.
- Some Pieces will have the ability to move out of the way in order to clear a path for the knights.

Project Block Diagrams

Hardware Block Diagram:



**Software Block Diagram:**



### *Project Budget and Financing:*

We are hoping to keep our project under \$1000 and to receive funding from SoarTech for our project. The software design of the project will be basically free; anything that is not coded originally will be from an open source.

### *Project Milestones:*

#### *Senior Design I:*

We want to have all of our research and hardware design complete by first week of December. We also wish to have our hardware parts ordered by the middle of November and our hardware prototyped on a prototype board by the beginning of December. This is to ensure we can design and order our PCB boards in a timely manner and give our Computer Engineers plenty of time to work with the hardware.

#### *Senior Design II:*

We don't want to have to pull any all-nighters to complete our project at the last minute. We would like to have the project completed and in testing for the final time with two weeks left until the final presentation to give plenty of time to possibly add new features or to be able to optimize our project in any way.