Posture Perfect

Initial Project and Group Identification Document

Spring 2016

Jacob Barr
Johnny Claros
Freddie Lopera
Floyd Petersen

I. Personnel

Group G Members

- **Jacob Barr, CpE**
  jaquo@knights.ucf.edu
- **Johnny Claros, CpE**
  johnny.claros@knights.ucf.edu
- **Freddie Lopera, EE**
  freddielopera@knights.ucf.edu
- **Floyd Petersen, CpE**
  flyda3rd@knights.ucf.edu

II. Project Motivation

In this day and age, a majority of our time is spent sitting on a chair. Whether it be for work, school, or purely entertainment. Due to the excessive hours spent on a chair, back problems have become an increasing issue all around the world. Many people seek out chiropractors and health physicians to find a solution to their poor posture while others look for gadgets that may improve their posture. Our device is intended for those people and for anyone who wants an economic solution to their posture. While many ergonomic chairs exist in the market today, they only address the posture of someone with the approximate height the chair was designed for. As a society we spend a large portions of our day sitting down comfortably on a chair of our time on a chair reading, writing, reviewing, and documenting behind a desk. Obviously, after several hours we typically tend to slouch and are not focused on our posture. While not all posture problems can be avoided, it is still important to minimize the stress on our backs in any way possible. This project seeks to minimize the effects of sitting behind a desk for people who sit for long hours. Simply reminding consumers of their slouching every so often will dramatically reduce back problems that may arise in the future.

III. Project Description

The Posture Perfect seeks to provide a virtual “map” of the user's posture and analyze it to provide a set of data that over time will help the user improve their poor sitting habits and posture. The data recorded could also be shared with the user’s physician to predict and prevent any future problems associated with their poor posture. The chair itself would have an array of sensors to measure the user’s height, weight distribution and the position of their back, among other possible things. Posture Perfect would also have some form of wireless communication capable of interacting with a compatible application. This compatible app would allow the user to check up on their sitting habits and it could suggest appropriate exercises to improve the user’s posture. A notification system could be implemented which would alert the user when their posture is poor for a certain period of time or when they’ve spent an extended period of time sitting down, where it could then remind the user to stand up and take a short break. A rumble feature could possibly be added to the chair for immediate posture correction or a secondary notification system.

IV. Specifications and Requirements

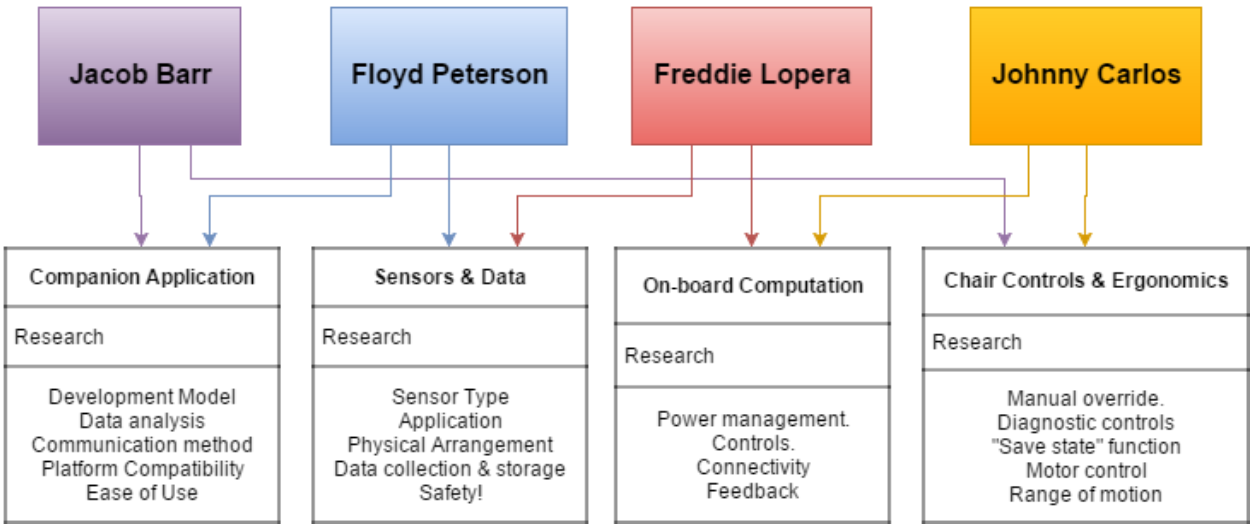
1) Must detect the presence of a human within the range of the chair.
    a. Range of chair: contact with seat
    b. Define human: IR source (not inanimate objects)
    c. Height of measurement: find height of person to calibrate sensors to measure posture correctly.
2) Communicate with a computation platform (ie. smartphone, computer, server)
    a. Share posture data.
    b. Receive updates.
    c. Send error reports.
    d. Give user recommendations to improve posture.
    e. Application on end device or remote server?
3) Provide accurate data of user posture
    a. Sensors
        i. Types: pressure/force, distance/depth, thermal.
        ii. Number: points on back important to posture
        iii. Accuracy: measuring to within +-5 mm
        iv. Cost: see project budget
    b. Calculations required
        i. Calibration (appropriate points)
        ii. Distance (position of persons back)
        iii. Force/weight distribution (is the person leaning)
        iv. Time (start timer)
    c. Data collection & storage
        i. Records kept on application
        ii. Database (possibly relational)
4) Adjustment of chair
    a. Lumbar
    b. Headrest
    c. Armrests
    d. Reclining
    e. Height
5) Power source requirements.
    a. Gather data during time in chair
    b. Chair is mobile
        i. Battery on-board
        ii. Charging by connection or wireless
6) Market potential (will it be a viable product)
    a. Easy to use
        i. Application is user friendly
        ii. Application is intuitive
    b. Convenient (very little upkeep or conscious user input needed)

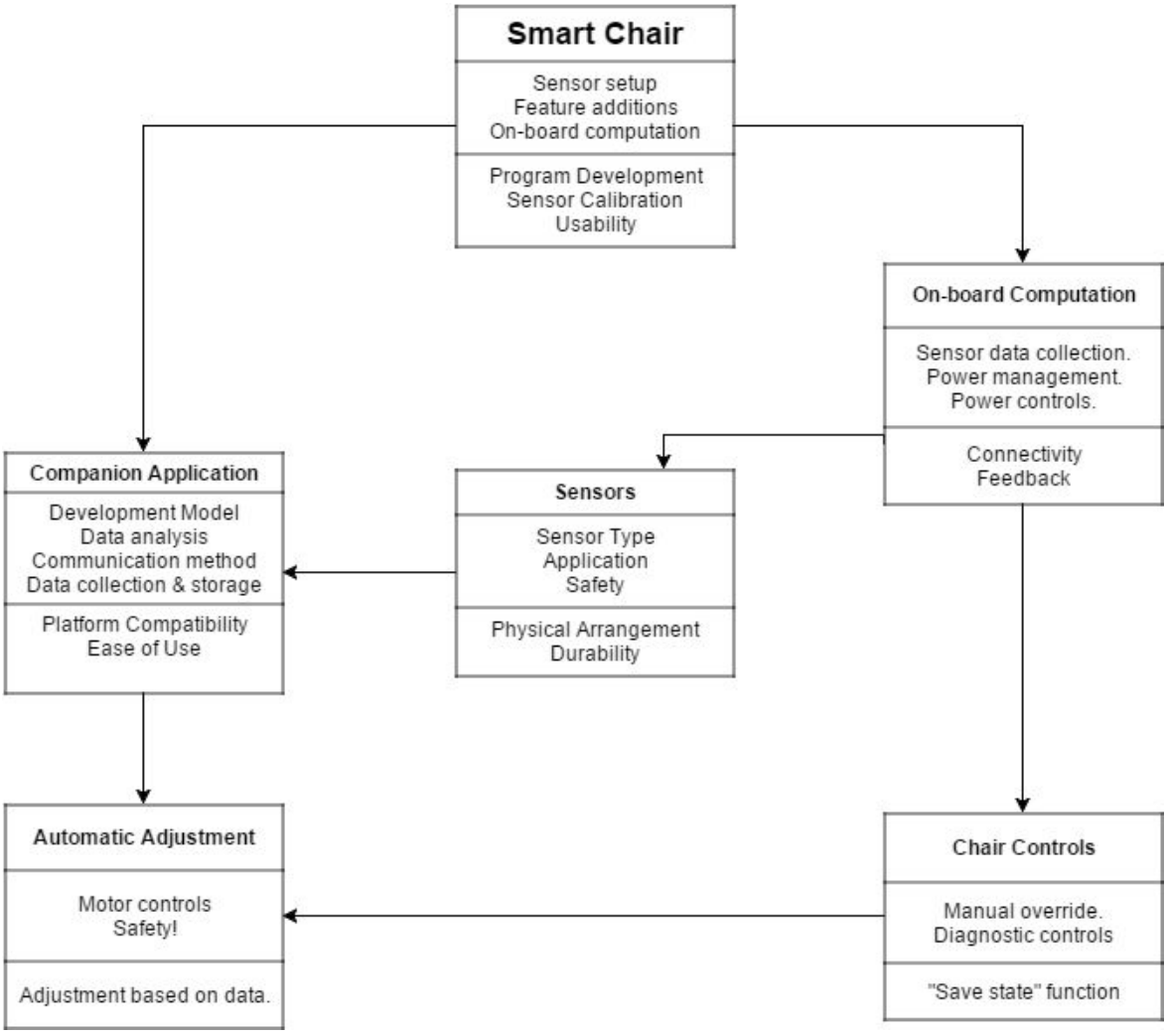
c. Cheaper than advanced ergonomic chair
d. Not very many competitors

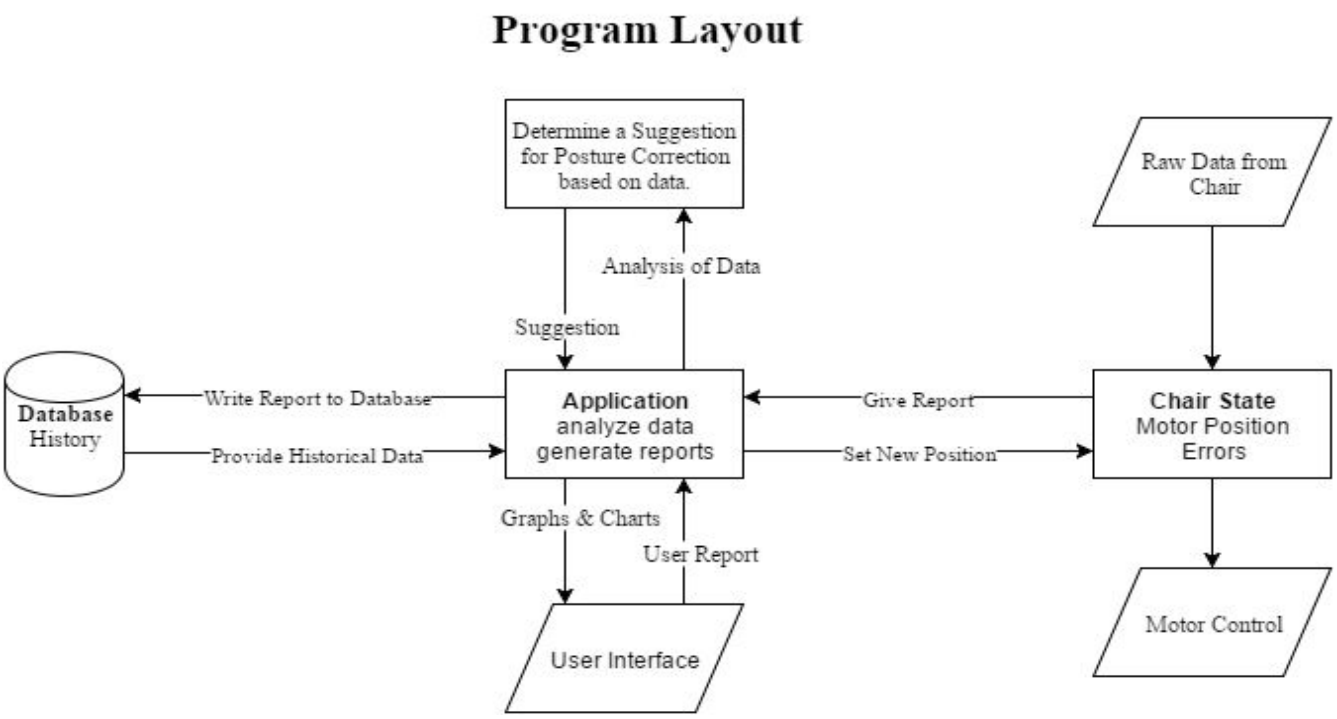
7) Application development
   a. Development model (waterfall, agile, etc.)
   b. Usability
   c. Cross platform
      i. Android
      ii. Windows
   d. Data representation formats
      i. Relational database
      ii. Graph and bar charts
      iii. Raw data
   e. Suggestion for posture exercises
      i. Sway Back
      ii. Flat Back
      iii. Kyphotic Lordotic
      iv. Military Posture
      v. Forward Head
      vi. Planks

V. Block Diagrams

Joint Responsibilities Held by Group Members




Smart Chair
Sensor setup
Feature additions
On-board computation
Program Development
Sensor Calibration
Usability
On-board Computation
Sensor data collection.
Power management.
Power controls.
Connectivity
Feedback
Companion Application
Development Model
Data analysis
Communication method
Data collection & storage
Platform Compatibility
Ease of Use
Sensors
Sensor Type
Application
Safety
Physical Arrangement
Durability
Automatic Adjustment
Motor controls
Safety!
Adjustment based on data.
Chair Controls
Manual override.
Diagnostic controls
"Save state" function



VI. Project Budget

Predicted budget based on educated guess	
Chair	$100
Sensors	$100
On-board device	$40
Wireless communication device	$20
Motors & Actuators	$80
App Development License	$50
Funding	$0
Out of Pocket Expense	$390

VII. Project Milestones

Senior Design I

- Finalize standards and designs used for project.
- Reach 120 page minimum, and then exceed it.
- Finish proof of concept prototype.
- Publish companion application that's user friendly.

Senior Design II

- Build the prototype
- Create companion application
- Test the prototype with success

Decisions to be made:

1. Name
2. Sensors
    a. Type(s)
    b. Layout
3. Where calculations take place (on device, or in companion app)
4. Chair power platform & charging system
5. Type of chair

VIII. Decision matrix

Rating system of 1(worst) - 3(best)	Cost	Familiarity of the technology	Educational goal	Motivation	Originality
Automatic Dog Feeder	3	3	2	4	1
Perfect Bike	1	2	3	3	1
Smart Chair	2	2	3	3	3