The remaining work needs to focus on expanding the capability of the systems, adding tools and games to the system, and integrating the Emotiv headset with a smart home API. As well as this, we want to create word of mouth for our project to start raising funds with our Kickstarter as well as finding some potential sponsors for our project.

In order to make the system better, we want to have a system that is able to dynamically recommend games for the patient and inform them of which areas they are not making as much progress. In addition, the system can be used bi-directionally: the therapist can prescribe areas/muscles the patient needs to work on, but the system can also recommend games that will utilize these muscles. The goal of this is to automate the role of the therapist. By automating the therapist’s role, we can reduce the time the therapist needs to spend with the patient thus reducing the cost incurred by the patient.

In addition to therapist automation, we want to have the games provide more feedback to the patients in an entertaining and enjoyable way in the form of a reward and achievement system. The current reward system will be improved upon in multiple plays. We want to create a reward system that provides more than just a message saying "good job." The reward system will have achievements, level progression, and potentially alter gameplay as users become familiar (or bored) with the controls. We think that expanding to the current set of games is as important as creating new games. We need to have games that are more than just a single level with no progression; one level games can make for very boring gameplay after a short period of time. We want to add multiple levels to all the games that feature change in audio, visuals, challenge, patterns, etc. similar to retro video games that were developed for the original Nintendo Entertainment System. Although the games will not feature highly advanced gameplay like many modern counterparts, we can create our games to feature the addictive gameplay that is associated with games built on the Nintendo Entertainment System.

It is important to provide positive feedback to the patients while they are playing the games. Our current system provides a progress report, but we want to add something a bit more tangible. During gameplay we want to provide motivation to the patients in the form of visual and audio stimulation. As well as this, we want to provide tools to help give the patients the ability to progress through a level at a faster rate. This is demonstrated in a game like Fruit Viking: when a patient is doing well they are rewarded with a war hammer that allows them to destroy more fruit at once; our goal is to provide functions like this within all of our games.

We want to improve upon the current system but also need to maintain it. Next semester we should support the occupational therapists and their patients. Although we believe that the system is validated with software, there are always bugs; and we need to dedicate some of our time to ensure that all the bugs are fixed in a timely manner so that the patients do not get discouraged with the system. We also need to maintain our standard feedback loop with the occupational therapists so that we can make changes and alterations to the system as necessary. As well as this, it will be important to increase the frequency of the feedback loop since they will be increasing the amount of patient testing.

Our final objective is to provide users who are unable to benefit from rehabilitation a major expansion to the current system so as to help them and improve their quality of life.
Specifically, we want to provide this system expansion to victims of SCI and TBI as well as any others who have severe upper limb impairment. The Emotiv headset is able to capture brain activity using 14 EEG channels.[10] The expansion will be a piece of software (specifically an application program interface) that is able to capture the user’s brain activity recorded by the Emotiv headset and act as an interface with smart devices around their home. The reason for this is to provide the patients with an interface that they can use to give them some control around their home that they no longer have.

The software will act as an interface deployed on the patient’s computer and interact with the Emotiv headset and the smart wireless devices around the patient’s home. This is the end goal for the Emotiv headset. With this software interface, patients will be able to control their smart devices around the home just by thinking. This will be very helpful to them because they will be able to do things that they previously could not. Tasks that once were hard because of the movement required could become simple; things like controlling the television, locking the doors without having to get up, turning the lights off, and the list goes on. The system will provide these people with some of the functionality that they lost as a result of their debilitating condition.

We will begin by investigating the capabilities of the Emotiv headset. This will include researching how the Emotiv headset communicates with devices. We need to learn how to create our own controls using the Emotiv headset; and in order to do this, we will need to learn how to exploit the EEG data from the development headset. After we can create controls for the Emotiv headset based on brain input, we can begin taking those signals and associating them with smart devices. Once we have controls for the smart devices, we will have to create the actual API. We will need to create a framework that is constantly polling for input from the Emotiv headset and have it execute the function requested by the user. It will be important to make the request to service loop fast enough so that the user does not get discouraged or lose focus and give up on using the helmet and revert back to using a different type of control system.

To conclude, by the end of the semester we want our system to feature fun, robust games that are effective for physical rehabilitation. These games will provide a rewarding achievement system that inspires further gameplay. We want to provide therapist automation that is capable of dynamically scheduling therapy for patients as well as giving therapists the option to prescribe therapy routines for the patients. We also want to have software that communicates between Emotiv and smart devices that has basic capabilities of controlling these devices fluidly.
<table>
<thead>
<tr>
<th>Phase 1</th>
<th>Phase 2</th>
<th>Phase 3</th>
<th>Phase 4</th>
<th>Phase 5</th>
<th>Phase 6</th>
<th>Phase 7</th>
<th>Phase 8</th>
<th>Phase 9</th>
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### JavaScript Games

- **Flipper Dolphin**
  - Co
  - Co

- **Frug Ninja**
  - Co
  - Co

- **LeapFrog**
  - M
  - M
  - M

- **Mirror visualizer**
  - M

- **Waterdrop enhancements**
  - M

- **WAP enhancements**
  - Co

- **Trace enhancements**
  - Co

- **WAP enhancement**
  - M

- **LeapFrog**
  - Co

- **Brick Breaker**
  - Co

- **Space Invaders**
  - Co

- **Implement HTML5 puzzle piece**
  - Co

- **Asteroids Game**
  - M

### Torque

- **First set of game demos**
  - M

- **Coin Collector**
  - Co

- **Implement games into system**
  - M

- **Statistics**
  - M

- **Research & gain**
  - M

### Sponsorship

- **Research & gain**
  - M

### Emotic brain controlled Helmet

- **API with controller of smart doors**
  - M

- **Full Smart API**
  - M

### Website enhancements

- **Contacts**
  - M

- **Help and feedback**
  - M

- **Codes for therapist reg**
  - M

- **Affect limb integration**
  - M

- **Codes for patient reg**
  - M

- **Achievement system**
  - M

- **Dynamic therapy scheduling**
  - M

- **Auto settings based on input**
  - M

- **Therapy routes**
  - M

- **New server-based deployment**
  - M

- **Standard updates**
  - M

---

**Note:**
- Completed = ch
- Co = co
- Planned = M

**Dotted line indicates some progress but not complete.**

**Completed planned but further is required:** Note upon completion and testing as a group, we usually find things we need to fix or improve on.
<table>
<thead>
<tr>
<th>Occupational Therapy</th>
<th>feedback</th>
<th>changes</th>
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<th>new stands</th>
<th>feedback loop</th>
<th>unresolved problems</th>
<th>troubleshooting guide</th>
<th>401 website</th>
<th>demos</th>
<th>pictures</th>
<th>videos</th>
<th>first semester final update</th>
<th>Handoff</th>
<th>unresolved problems list</th>
<th>stream line code</th>
<th>prepare system for new hardware</th>
<th>Report</th>
<th>presentations</th>
<th>results</th>
<th>reports</th>
<th>demos</th>
<th>directions</th>
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<th>feedback</th>
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