

Safety and Security Enhanced Wheelchair

Group 10:

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Sponsor will be: One or all of the group members.

This project is intended to make using a wheelchair more convenient, safe, and secure by using modern technology. The fact that people still must use handle breaks on both sides to begin getting out of their wheelchair is inconvenient and unreliable. If someone is assisting them, they must remember to walk to both sides of the wheelchair and lock each wheel before assisting the wheelchair user in or out of the wheelchair. In addition, at public locations (such as Disney World), there is a problem of wheelchairs being taken by other parties when not being watched (in order to use for themselves, to get to the front of lines, etc.). The security enhancement feature of the wheelchair will change this by using RFID technology as a kind of “proximity key” system for the owner—discussed further below.

The project is split into two major goals which will both affect the wheel locking mechanism. Safety and Security.

Safety, also for convenience, is done using several pressure-sensitive pads on the chair (in the seat and armrests/grips at least) used to detect when someone is getting in or out of the chair. This will remove the need to manually lock and unlock the wheelchair wheels when transitioning in or out of the chair, and beginning the motion will lock them automatically. A switch may also be added to force a wheel lock when sitting in the chair, if wanted. Depending on observations of different ways in which people are moved in and out of wheelchairs, other pads may be added (such as near the foot area) to detect other methods of entry/exit. In addition, a toggle may be added by the handles if someone is assisting the wheelchair user, allowing a navigator (or the wheelchair user themselves) to lock the wheels with a simple squeeze of the handle (optional feature).

Security will be achieved by using an RFID key and receiver. If the key is not within proximity of the chair, the wheels will lock regardless of the state of the pressure pads. (Optional) This may have a way to disable the RFID requirement by a switch, but it would only be able to be toggled when the RFID chip was already in range.

The parts (microcontroller and otherwise) should be as low-power as possible so that the charger and battery are plenty to assure functionality of the unit under any reasonably normal usage. The precision and accuracy of the pressure pads does not need to be high, only enough to detect major shifts in weight.

The system will be easy to use, being mostly automated with only a few (optional) switches to change behavior. Once built, the unit will be integrated with the wheelchair. The only moving part (and therefore the only part prone to failure over time) would be the mechanical locking mechanism, but hopefully without motion the mechanics will last for several years at least.

The locking mechanism does not need to be quiet, as an audible recognition of the locking/unlocking may be useful to the user.

We hope that this project will prove to be of benefit to wheelchair users; improving their safety, security, and convenience by using modern technology.

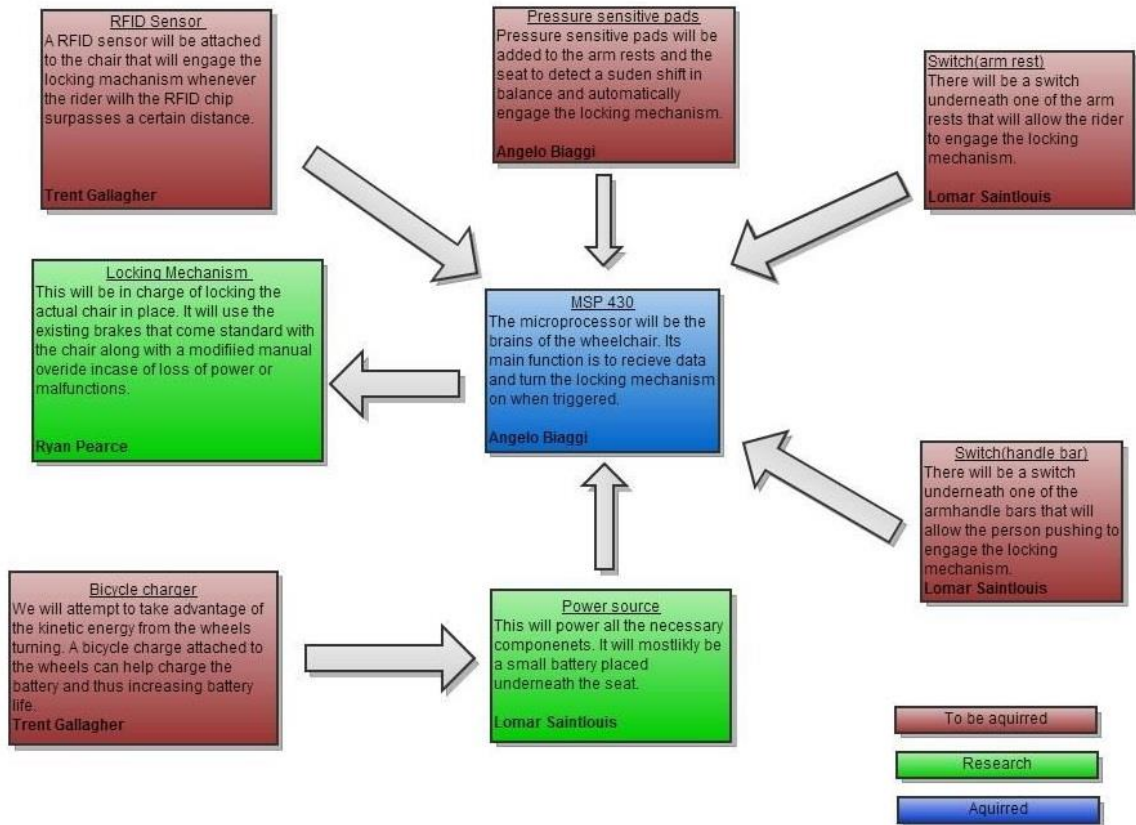
Requirements

- The device must be a wheelchair
- The device should be equipped with custom automatic brakes
- The Brakes Should be battery powered
- The device must have custom brakes on both wheels
- The device shall be equipped with a pressure sensitive pad
- Pressure sensitive pad must be able to determine if user is getting up or not
- The pressure pad must determine whether owner is out of the chair or not
- The device's brakes should be power by battery
- The Battery must have a charging device
- Charging device must keep charging battery
- The device must have a sensor chip
- The sensor chip must be wireless
- The wireless remote(sensor chip) should be battery powered
- The wireless remote should flash when device brakes are being unlocked
- The brakes must automatically lock when as soon as pressure pad detects no weight
- The brakes must automatically unlock when device remote is in range
- Brakes must be able to remain locked indefinitely when remote is not in range
- The range of the remote must be within 5 feet
- The Device must be equipped with a hand bar to lock manually
- Wireless remote must have a unique key to device
- The Brake must have a failsafe in case power goes out

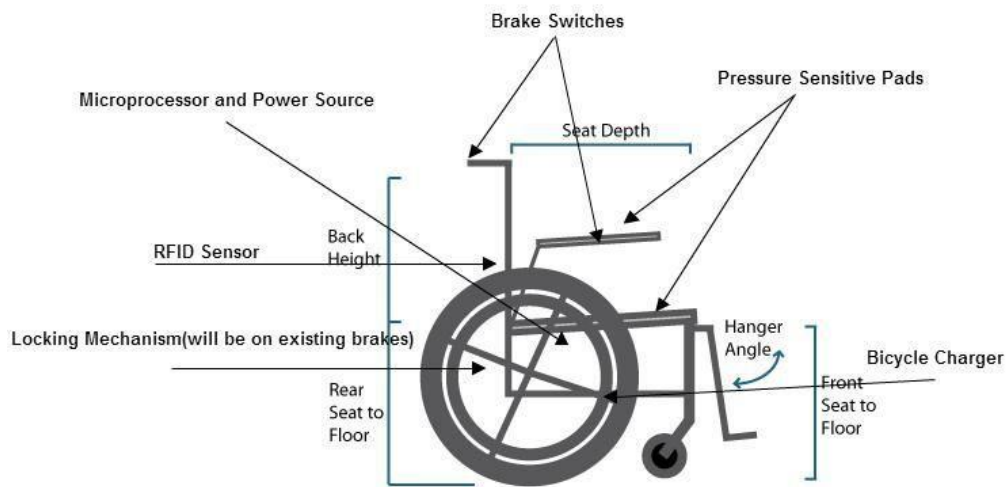
Specifications

- Wheelchair
- Charger
- Battery
- Microcontroller
- Pressure sensitive pads
- RFID chip sensor mechanism (Wireless remote)

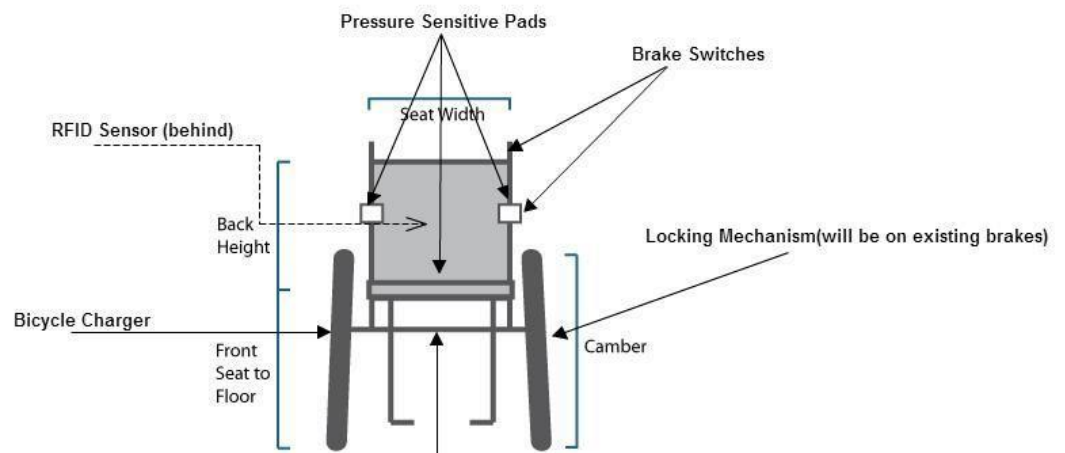
Safety and Security Enhanced Wheelchair Block Diagram



Prototype Illustrations



SIDE VIEW



FRONT VIEW

Budget and Financing

Item	Cost per Unit	Amount	Total Cost
Battery	\$100	1	\$100
Charger	\$50	1	\$50
Wheelchair	\$200	1	\$200
Microcontroller	\$50	1	\$50
Pressure Sensitive Pads	\$75	3	\$225
RFID Chip Sensor Mechanism	\$50	1	\$50
Total			\$675

Project Milestones

	Start Date	Due Date	Work Duration (Weeks)
Research	May 30, 2013	July 11, 2013	6
16 Pages Written	May 30, 2013	June 6, 2013	1
32 Pages Written	June 6, 2013	June 13, 2013	1
48 Pages Written	June 13, 2013	June 20, 2013	1
64 Pages Written	June 20, 2013	June 27, 2013	1
80 Pages Written	June 27, 2013	July 4, 2013	1
96 Pages Written	July 4, 2013	July 11, 2013	1
112 Pages Written	July 11, 2013	July 18, 2013	1
128 Pages Written	July 18, 2013	July 25, 2013	1
Order Parts	July 18, 2013	August 1, 2013	2
Build Prototype	August 22, 2013	October 24, 2013	9
Testing & Debugging	October 24, 2013	November 21, 2013	4