STONY BROOK UNIVERSITY
School of Engineering and Applied Sciences
Department of Mechanical Engineering
113 Light Engineering Building
Stony Brook, New York 11794-2300

Principal Investigators:

Qiaode Jeffrey Ge (631) 632 8315 Qiaode.Ge@stonybrook.edu
Fu-Pen Chiang (631) 632 8311 fchiang@notes.cc.sunysb.edu

The Chaircycle

Designers: Jacob Moon, Louis Paul, Jun Lee
Client Coordinator: Thomas Rosati, Premm Learning Center, Oakdale, NY
Supervising Professor: Dr. Michelle Nearon
Department of Mechanical Engineering
Stony Brook University
Stony Brook, NY 11794-2300

Insert Figure 1	Insert Figure 2
Figure 1: Designers hard at work.	Figure 2: The Chaircycle Prototype.

INTRODUCTION

The Chaircycle is the fusion of a wheelchair and a bicycle. The purpose of this fusion is to create a solution that will provide a practical solution for the paraplegic individuals who must travel short to intermediate distances on a daily basis. It provides an alternative motion required in propelling the wheelchair using cycling components. Users will be able to travel longer distances without having to switch their mode of transportation.

SUMMARY OF IMPACT

The Chaircycle will impact paraplegic users in giving them a new degree of freedom and mobility. It will eliminate the hassle of getting into an automobile to travel moderate distances. The user can utilize the Chaircycle as an everyday wheelchair but can also use it to travel distances ranging from 1 to 5 miles where paved roads are provided. This will impact the user in their added motivation to travel and enjoy the outside. It will also give them another medium of exercise in order to improve in the area of cardiovascular health.

TECHNICAL DESCRIPTION

The Chaircycle provides an alternate input motion of propelling the wheelchair. Instead of directly spinning the wheels, the Chaircycle provides a more ergonomic motion in driving the wheels indirectly. This motion is made possible by a crank-slider mechanism. The rotational motion generated by this mechanism is transferred to an input gear which is then transmitted to an output gear via a chain link. This output gear is attached to the 20-inch bicycle wheels. There are two identical systems, one for both sides which are not connected by any means. They are purely independent which provides the method of maneuvering the Chaircycle. If the velocity of the right wheel is slower than that of the left, the Chaircycle will veer to the right and vice versa. The handbrakes which are attached to each wheel and handlebar can also provide maneuvering capabilities. These two methods work in conjunction to provide sensitive and meticulous maneuverability.

The frame of the Chaircycle is constructed of stainless steel tubing of 1-inch diameter and 0.054-inch thickness. There are a total of 14 individual pieces amounting to over 23 feet in total length. There are 20 weld points connecting the pieces to create the frame with eight 90 degree bends. The cycling components which consist of the slider, input and output gears, chain link, connection hub and main drive wheels are all fitted into the frame and is visualized in Figure 3 below. The components work in conjunction to provide the drive motion necessary to propel the Chaircycle to a speed over 10 miles per hour. The Chaircycle's total cost was $554.78.

Insert Figure 3	Insert Figure 4
Figure 3: Exploded View of the Chaircycle	Figure 4: Isometric View

Handicap Assisted Treadmill

Designers: Roger Lee, Teuh Cheng, Justin Margolis
Client Coordinator: Thomas Rosati, Premm Learning Center, Oakdale, NY
Supervising Professor: Dr. Raman Singh
Department of Mechanical Engineering
Stony Brook University
Stony Brook, NY 11794-2300

Insert Figure 5	Insert Figure 6
Figure 5: Top half of the treadmill including harness, weights, and pulley system.	Figure 6: Lower half of the treadmill.

INTRODUCTION

The goal of this project is to design an adjustable weight support system to alleviate stress from rehabilitation patients who want to revitalize or increase lower body locomotive functions. Patients recovering usually have a hard time exercising and stimulating their lower body and often require assistance in their exercises. This support system eliminates help from the assistant and the patient is free to exercise independently.

SUMMARY OF IMPACT

The primary function of this machine will be to hold and slightly lift the patient so the patient's legs will not be required to support his/her total body weight. With less weight acting on the legs, the patient will be able simulate a walking motion more easily.

TECHNICAL DESCRIPTION

The device comprises of a metal frame containing a stack of weights sitting on the bottom. The weights are connected to a cable that goes through the hole in the middle bar and loops through the top pulley and the angled cantilever pulley. At the end of the pulley, a harness is attached. To operate this device, a weight selector pin will be inserted for the desired amount of weight to alleviate. The harness is to be located higher than the patient and he/she will have to step on something structurally stable to get to the correct height to strap in the harness. The patient will then step down and can begin exercising with a fraction of their weight. The design of the frame is to encompass electric treadmills of all sizes.

The entire frame is made of extruded aluminum tubing and is structurally safe for our purposes of alleviating a hundred pounds maximum. The part with the most stress concentration would be the angled cantilever but it is also very safe due to welds being a lot stronger than the material. The total cost of our project was approximately $1013.

Insert Figure 7

Figure 7: CAD drawing of the device (Isometric View)

Stair-Climbing Wheelchair Elevating Device

Designers: Lisa Chan, Chungchi Chen, and Amara Tazeem
Client Coordinator: Thomas Rosati, Premm Learning Center, Oakdale, NY
Supervising Professor: Dr. Imin Kao
Department of Mechanical Engineering
Stony Brook University
Stony Brook, NY 11794-2300

Insert Figure 8

Figure 8: An isometric view of the device.

INTRODUCTION

The objective of this design project is to create an add-on device that can assist handicapped users, in moving up and down stairs. These handicapped users are either not capable of the gross and fine motor skills involved in walking or cannot stand upright due to severe physical disabilities.

SUMMARY OF IMPACT

To suit the needs of this broad range of users, the add-on device attaches onto an already existing transport wheelchair to allow both it and the user the ability to scale stairs. Constraints wise, the user must maintain being seated in the chair as it ascends the stairs, and must be able to grip with their hands. In addition, the chair and device will need to be pushed and supported by a caretaker.

TECHNICAL DESCRIPTION

Referring to Figure 9 to a schematic of the design, in order to attach the Track [A] to the Track Leg [B], the team was advised by the Machinsts to use a rectangular piece, Track Adaptor [K] to act as a joint connector where a bolt will be inserted on the bottom hole. Since this adaptor needs to be able to rotate, a shoulder bolt will be used to secure the two together.

The Track Leg [B] is inserted directly into the Track Adaptor [K] and pegged on the side, in the upper hole, to keep it in place.

The Secondary Wheel [J] is made to be in plane with the Track [A] in front of it, so that contact can be initiated. The configuration seen here is at the device's rest position where the Track's lower edge is higher than the Secondary Wheel [J] in front of the wheel.

Since the Track Leg [B] is made of two segments to allow it to extend and retract, this was done by using two hollow tubes. The larger diameter tube is the one that is attached to the Track Adaptor [K]. The smaller diameter tube is located within the larger tube at one end and the other end is attached to the Rod Ends [C]. Not depicted here is how the two bars will catch within each other to prevent further extension, through use of a spring latch.

The Secondary Wheel Leg [I] is attached at one end to the Secondary Wheel and at the other end to the axis that the Rod Ends [C] will turn on.

There are a total of three other Adaptors beside the Track Adaptor [K]. The Front Track Adaptor [D] and Back Track Adaptor [G] both attach the device's Slider Tube [F] to the wheelchair's perpendicular joints. The 4 fingered or 3 fingered grips are designed to be able to wrap around the wheelchair tubing and nuts and bolts are then used to clamp the ends down.

The Sliding Tube Adaptor [E] is the most complicated of the four because of the multi functioning as a corner rotating joins. The Sliding Tube is inserted into one end of it and pegged down. On the other end is a square opening to place the Rod Ends inside. In addition, there is a tube that enters the side of this opening to act as axis for the Rod End to rotate upon. The Rod End [C] is used as a rotating joint for the track leg.

To elaborate on the Sliding Tube [F], both ends are inserted into adaptors that are then pegged in. A slider attachment is then attached to the tube and the Connecting Bar [H] connects this with the outer tube of the Track leg assembly to cause the rotating and extension property.

The cost of the device is roughly $1000.

Insert Figure 9

Figure 9: Component Breakdown of Design

Multifunctional Quadricycle

Designers: Anita Singh, G. Paramathas, and Md Shariful
Client Coordinator: Thomas Rosati, Premm Learning Center, Oakdale, NY
Supervising Professor: Professor Imin Kao
Department of Mechanical Engineering
Stony Brook University
Stony Brook, NY 11794-2300

Insert Figure 10	Insert Figure 11
Figure 10. CAD Drawing of Multifuntional Quadricycle	Figure 11: The prototype.

INTRODUCTION

This Multifunctional Quadricycle was specifically designed for working parents of a family of 4 living in a suburban neighborhood. In this day and age many people are concerned about their health and desire more time to exercise. Those with children also desire to have more time for their children. However many parents complain that there are not enough hours in a week to complete all they want to accomplish because of work and chores needed to complete around the home This machine will allow one to spend time with the whole family, while exercising and mowing the lawn.

TECHNICAL DESCRIPTION

The Multifunctional Quadricycle caters for two adult passengers located at the rear two seats. It also caters for two small child passengers in the front two seats. The child passenger seats are suited for the smaller limbs of a child. The children seated with their feet resting on a bar and a long handle bar to hold. The adult passengers will power the vehicle by pedaling. The steering will be controlled by one adult, the driver. The frame is roughly 3'X5'. It is tapered in front to cater for the turning of the front wheels for steering. The steering system is aided by a double U joint which is connected to several eye joints that help to direct the wheels. The brackets are extended for easier turning abilities of the quadricycle. The brakes are similar to those of a bicycle. They are caliper brakes. This may be controlled by either of the adult passengers. The mowers are reel mowers that will be pulled along behind the quadricycle. This part is detachable and safe. This part was not completed due to lack of time and funds.

The total cost of the prototype is approximately $1500.

Accessible Medication Dispensing Device

Designers: Ayman Sawas, Warren Halbig, Mohammad Yusuf
Client Coordinator: Thomas Rosati, Premm Learning Center, Oakdale, NY
Supervising Professor: Dr. Raman P. Singh
Department of Mechanical Engineering
Stony Brook University
Stony Brook, New York 11794-2300

Insert Figure 12	Insert Figure 13
Figure 12: The medication dispensing device	Figure 13: The device with the door open.

INTRODUCTION

Many people have to take several medications with specific dosages on a daily basis. It is difficult to remember to take a specific dose of a particular medication at the proper time of the day, especially for patients with disabilities, which can cause a lot of stress. There are devices on the market such as pillboxes, but these are inefficient. Pillboxes and other devices are only good for simple medication schedules.

SUMMARY OF IMPACT

The goal of this project is to develop an innovative device that can keep track of a patient's complicated medication schedule and automatically alert and dispense the proper dosage is necessary. To accommodate for patients of different disabilities, the dispenser will have different notification methods. The system will also have the ability to keep track of what medications have been taken and what is currently in the inventory.

TECHNICAL DESCRIPTION

Medication is stored in carousel systems which are discussed under dispensing system below. Figure on the right shows an assembly drawing of the prototype. The mechanical structure has a flat square base. Two crossbar uprights are erected on the opposite sides of the base. Then three beams are attached across the uprights. These beams support the dispensing structure. Also four right angle brackets are erected from the four corners of the base to support the enclosure. Clear polycarbonate lexan is used to make the cover for the enclosure and is attached to the uprights. For the front, a door is made of lexan and is attached via a hinge to the enclosure. A magnetic latch is used to hold the door closed. The thickness is chosen to be 0.25"for the uprights and the beams to provide rigidity while keeping them light in weight. One stepper motor is placed at the middle of each beam. A large hole at the center of the beam allows for an adaptor shaft, which transmits power and motion from the motor to the carousel and dispensing system. A description of the carousels and the chute are given below under dispensing system.

Dispensing System:
The dispensing system begins at the storage area. The medication pills, tablets, or capsules are contained in the dispensing carousel which has 31 usable compartments. The carousel trey has a cover that fits tightly because there is an o-ring seal between the cover and the trey wall. The carousel tray is located on the beam of the machine via two ¼" pins. This prevents any motion along the beam surface. To prevent the entire carousel from moving upward or falling off the motor shaft, a ball detent locks it into the divider disc. The dispensing system releases the medication by incrementing a stepper motor 11.25 degrees. Each rotation moves a filled compartment over an identically shaped hole in the carousel tray. The medication then falls into the dispensing chute.
Electrical System:
The design of the medication carousel depends on a specific rotation each time. The design requires 11.25 degrees of rotation. This is accomplished by "half-stepping" the stepper motor. The motor has a 7.5 degree step, pulsing the motor to increment 3 "half-steps" provides 11.25 degrees. The motor and LCD screen is be controlled through a parallax electronic board powered by a 12V power supply. The microcontroller is programmed with BASIC Stamp.
Operation:
The first step in using the accessible medication dispenser is for the user to enter his or her medication schedule. Each carousel is simply loaded by placing the medication into the compartments. If the user is not capable of loading their own medication carousels, loading may be done offsite by a caretaker, family member, or pharmacy. When the time is proper for taking the medication, an alarm will sound with a flashing light to alert the user. Upon hearing the alarm, the user pushes a button that causes the system to dispense the proper medication into a tray. On the LCD screen it displays that dispensing is complete and shows how much medication is left in the carousel. If the button is not pressed, after two minutes the alarm and the buzzer stops and it records the event.

Insert Figure 14

Figure 14: The CAD drawing of the device.

The Transporter

Designers: Kelly Hsu, Qixian Huang, Jingwen Li, Srinivas Pendikatla
Supervising Professor: Dr. Peisen Huang
Department of Mechanical Engineering
State University of New York at Stony Brook
Stony Brook, NY, 11794-2300

Insert Figure 15	Insert Figure 16
Figure 15: 3D view of the Transporter	**Figure 16: The Prototype**

INTRODUCTION

In many instances, it is necessary to move a child to and from a wheelchair. At the Premm Learning Center, a school for disabled children, students usually are placed on a floor mat during lessons. However, they need to be moved into a wheelchair for transportation and to help blood circulate. This requires the caretakers to move each student in and out of a wheelchair numerous times a day. One complaint by the caretakers is that it can be strenuous to perform this action multiple times a day. Therefore the goal of this project is to reduce the work performed by the caretakers in moving a child from a wheelchair onto a bed or floor mat.

SUMMARY IMPACT

This project develops a device to help caretakers move a student to and from a wheelchair. The specified users are children with a maximum height and weight of 5 feet and 150 pounds respectively. The energy spent in lifting and lowering a child manually is lessened by implementing a mechanical system of a crank winch. The mobility of the device allows it to be used in various situations and locations.

TECHNICAL DESCRIPTION

The design of this device is broken down into two main components: the frame and the car. Each component is treated as two smaller projects although the design and manufacturing of the frame relies heavily on the design of the car.

The frame acts as a support for the lifting mechanism. It is designed to support a load of 600 pounds, which includes a factor of safety of four, at any point along the track. Buckling and balance issues are checked by analysis. Steel is selected as the best material for the frame. The track is attached to the top of the frame at a height of 60 inches to provide an elevation range of 0-30 inches. Casters wheels are attached to the bottom of the frame to allow for the mobility of the device.

The car provides the simple translation motion along the horizontal and vertical directions. Aluminum is used to construct the car because it limits the weight of the mechanism compared to steel. A winch with a high load capacity is used to perform the lifting and lowering of the user. The V-groove wheels of the car enable the user to be moved along the tracks of the steel frame to the desired location of a bed or floor mat. A brake system is installed on the rear two wheels of the car to add to the safety of the user. The wheels on the car and on the frame can be locked during the loading and unloading of the user to prevent injury.

Insert Figure 17	Insert Figure 18
Figure 17: 3D view of the car.	Figure 18: 3D view of the brake system.

ARTICULATING THERAPUTIC WHEELCHAIR

Designers: George Lau, Steven Plaxsun, Jainarine Ramkumar
Client Coordinator: Thomas Rosati, Premm Learning Center, Oakdale, NY
Supervising Professor: Prof. Chad Korach
Department of Mechanical Engineering
Stony Brook University
Stony Brook, NY 11794

Insert Figure 19	Insert Figure 20
Figure 19. Side view of the prototype	Figure 20: Rear view of the prototype

INTRODUCTION

The goal of this project is to design a wheelchair that allows the user to move from a sitting position to standing position or lying down position. To lie down the seat of the wheelchair will remain stationary while the back reclines and the leg support is raised. To stand up the seat and back of the wheel chair will be moved together to a vertical position as the leg support lowers to the ground for stability. The ability to move from a lying down position to a standing position promotes physical health by increasing circulation, preventing muscle atrophy, and preventing respiratory problems as well as mental health by allowing the user greater independence and ability.

SUMMARY OF IMPACT

Most people can change from sitting to standing or laying down depending on there needs. The disabilities in the children we met prevented them from lying down if they were tired or standing up to move there muscles. Currently the children have to be moved every half an hour from a stressed position to an unstressed position by the caretakers which take significant time and effort from both. Our design will significantly reduce the time and effort required allowing more time to be spent caring for and not moving the children. We were also able to accomplish our goal of building our project for under 1000 dollars which is far cheaper then the 20000 dollar standing wheelchairs currently available.

TECHNICAL DESCRIPTION

Our articulating wheelchair uses 2 systems of linear actuators to control the motion our design requires. System A uses a single actuator mounted to the bottom of the seat and controls sitting to lying down or lying down to sitting. As the linear actuator pulls in the bottom shaft it raises the leg support and the vertical shaft lowers the back support. The central pivot is grounded to the main pin connecting the back support plate to the thigh support plate. The linear actuator is connected to the quaternary link at the node closest to the main pin. The two other nodes connect to links going to the back support plate and the leg support plate. System B moves our device from sitting to standing or standing to sitting. We choose two linear actuators mounted on both sides of the device for strength and balance since it will also directly support the weight while in the sitting position. The system is directly linked to the main pin support connecting the back plate to the thigh plate. Our group used 3 actuators, one with 10 inches of travel and 2 with 16 inches of travel. Both actuators are self locking power screws up to 200 pounds and have a maximum load rating 250 pounds. Our control system has two switches ,one switch for each system, that due to our circuit design, automatically and independently reverses the polarity to each system. Our wheelchair was manufactured using wood to reduce manufacturing costs as well as material costs. The actuators chosen were from automotive applications which cut our actuator costs by two thirds while still meeting design requirements.

The total cost of the prototype is approximately $742.

Insert Figure 21

Figure 21: CAD drawing of the articulating wheelchair.

Easy Toilet Access Wheelchair

Designers: Stanley Boutin, Chang Gen Tan
Client Coordinator: Thomas Rosati, Premm Learning Center, Oakdale, NY
Supervising Professor: Proffessor Lili Zheng
Department of Mechanical Engineering
Stony Brook University
Stony Brook, NY 11794-2300

Insert Figure 22	Insert Figure 23
Figure 22. Demonstration of Easy Toilet Access Wheelchair	Figure 23. A prototype of the Easy Toilet Access Wheelchair.

INTRODUCTION

The Easy Toilet Access Wheelchair is designed to allow disabled individuals to easily use the restroom. The design objective is to design a wheelchair that allows disabled individuals to use the toilet without having to physically remove themselves from their chair. The wheelchair will also functions as a normal wheelchair. This will make the task of using the restroom more convenient and hygienic.

SUMMARY OF IMPACT

The Easy Toilet Access Wheelchair targets disabled individuals who are interested in a product that will help them use the restroom. In order for wheelchair users to use the restroom, they must get out of the chair and sit on the toilet seat. This can be very time consuming and may even require the assistance of a helper. In addition the restrooms seats and toilet area can be very dirty.

TECHNICAL DESCRIPTION

Wheelchair Frame

The design of the wheelchair will contain a frame that is modified from a standard wheelchair. The wheelchair chosen was the Invacare Tracer Ex2 Swingaway wheelchair. The tubing is made out of carbon steel will that is chrome plated. The tubing has outer diameter of 0.875 with inner diameter of 0.75. The Tracer Ex2 is foldable with a crossbar underneath the seat. The crossbar provided a problem with the wheelchair backing into the toilet seat. The wheelchair will have no bars directly underneath the seat. The clearance beneath the seat must clear the toilet dimensions of 14 inch width and 17.5 inch height. The height from the seat to the floor will be 21 inches. The first modification done to the frame was to weld three horizontal bars along the width of the frame. The three bars measure 21 inches each were used for this connection. The frame is wider than most standard wheelchair. This design will allow enough room for the wheelchair to clear the width of the toilet. The second modification made to the wheelchair was to raise the height of the wheelchair. The height of the seat of the original frame was about 17 inches.

Seat and Cutout

The seat will be rectangular with width of 22 in. and depth of 16 in. There will be a cutout section at the back of the seat. The seat is made of 0.5 in. hard plywood. Plywood is a strong material that will be able to hold the required weight. There is a piece of aluminum sheet metal below the plywood. This will help keep it clean and dry when using the toilet. The aluminum surface will make it easy to clean also. The seat cutout will contain two pieces that are symmetric. The cutout sections will be the same material as the rest of the seat. The two sections will be 11 in. long. The larger end of the piece will have 4 in. wide with the smaller end being 2 in. wide. This is the approximate shape of a toilet seat that is slightly modified. Each piece has 4 0.25 in. diameter and 0.5 deep. This will allow it to connect to the linkages.

Mechanism for cutout motion

The mechanism for raising and lowering the cutouts will consists of a series of linkages. The system will have one degree of freedom with one driving bar. The system will consist of a four-bar linkage. There will be four of these linkages, two on each side. This will allow the load to be distributed four ways equally along the linkages. The bottom piece that is connected to the ground will rotate. As that piece starts to rotate, the other bars will be forced to follow a set pattern. This type of movement will allow the section to open and close.

The total cost of the prototype is approximately $469.

Insert Figure 24

Figure 24: CAD drawing of the Easy Toilet Access Wheelchair (Isometric View)

Beach Mobility Device: B.A.N.D.I.T

Designers: Odean Foster, Adam Kulawy, Aaron Machtay, Jonathan Vaillancourt
Supervising Professor: Dr. Jeffery Ge
Department of Mechanical Engineering
Stony Brook University
Stony Brook, NY 11794-2300

Insert Figure 25

Figure 25: A prototype of the manual wheelchair for beach access

Insert Figure 26

Figure 26: BANDIT

INTRODUCTION

The design objective for this project is to design a device which would allow a wheelchair bound person to traverse the rough, uneven, shifting terrain found on a beach. For various reasons, normal wheelchairs are unable to do this, which creates a need for a new design. Two designs were considered and manufactured: a manually driven separate chair (see Figure 1: Manual wheelchair for beach access) and an electrically powered platform that allows the user to remain its own chair (Figure 2: BANDIT). The main focus of this project, is on the BANDIT.

SUMMARY OF IMPACT

The BANDIT is designed to be a treaded cart capable of going over rough terrain and the ideal is to allow the user independence in doing so. Current designs, including our own manual wheelchair design, usually require a care-taker to assist the user and possibly even drive them. The BANDIT eliminates that need altogether.

TECHNICAL DESCRIPTION

Of the two designs built, the manual wheelchair design was much simpler. It is a basic wheelchair with oversized, under-inflated tires. These tires yield a larger surface area in contact with the sand, which prevents them from sinking and jamming. Four tires were used to increase stability, versus a three tire option. This design requires a second person to act as the driving force. To the back of the assembly, an arm was attached to assist that person with pushing or pulling. This arm also acted as a lever, which needed to be lifted or lowered, that would allow the vehicle to pivot around a point. This acted as a primitive form of steering.

In contrast, the BANDIT was a much more complex design. The design resembles a treaded cart, and can be most similarly compared to the system seen on a tank. A wheelchair bound person would be able to load onto this cart and drive it onto rough terrain. Each tread on this cart is driven and controlled independently. This is done by using two separate 600 watt motors and twist grip throttle controllers. Each side also utilizes a contactor that reverses the electrical poles, which in turn allows the motors to drive in reverse, and therefore drives the vehicle in reverse. Because each track is driven independently, the steering mechanism employed involves driving one track faster than the other. This method is called skid steering and this turns the vehicle in one direction or the other. This whole system requires a strong background in electrical engineering as the motors will need to run in a variety of different ways and speeds, rather than just simple direct drive. An Electrical Control Unit was utilized to control the voltages in the motors, which changed the rotations per minute that was being output.

The frame of the vehicle was made up of aluminum, which was found to be completely structurally sound for what was needed. Essentially, this saved on weight, money, while still remaining strong enough to withstand a variety of load intensities. A simple suspension system is attached to this frame. For each track, a bogie system was utilized, similar to the suspension found on a snowmobile. These systems have a torsion spring which deflects creating suspension travel. This system also acts to increase the tension applied on the tracks.

The total cost of the prototype is approximately $1,700.

Patient Transferring and Positioning Aid (PTP)

Designers: Thejus Philips and Kam Fai Wong
Client Coordinator: Antonio Indelicato, Stony Brook University Hospital
Supervising Professor: Dr. Jeffrey Ge
Department of Mechanical Engineering
Stony Brook University
Stony Brook, NY 11794-2300

Insert Figure 27
Figure 27: Transferring aid in lowered reclined position

Insert Figure 28
Figure 28: Transferring aid in raised seating position

INTRODUCTION

The Patient Transferring and Positioning Aid, known as PTP for short, is a medical device designed with two goals to assist disabled patients. First, it will help patients with limited leg movement be transferred onto a medical imaging table, such as MRI's, CT's, and X-rays. Second, it will help that patient remain in a static position during a medical imaging scan. The purpose of the PTP is to make it easier for disabled patients to have access to medical imaging devices with less hassle for the doctor or caretaker.

SUMMARY OF IMPACT

The PTP is designed based on the disabilities of six patients listed from the RERC 2006 National Student Competition. These six patients suffer from disabilities such as paralysis, heart failure, diabetes, obesity, stroke, and Parkinson's disease; the PTP will make it easier for these patients to have access to medical imaging devices. The PTP consists of two parts; the seating frame can be transformed from a seat to bed and raised to heights of medical imaging devices, making it easier for patients to get onto the higher tables. The positioning aids are placed on a mat that is placed on top of the seat and can be slid onto imaging tables, and will assist in keeping a patient in static position during a scan.

TECHNICAL DESCRIPTION

The PTP is made of two parts, the transferring device and the positioning mat. The transferring device is a frame made of metal that can be folded down from a seat to a flat bed. It consists of three hydraulic jacks, one for raising and lowering the back, one for the legs, and one for raising and lowering the seat. A scissor bar linkage is also designed to provide extra support and prevent tipping of the device. The frame is made of steel and steel tubings. A track with rollers has been designed on top of the aid to allow the positioning mat to be sided onto and off the device. The positioning aid will be used within MRI and CT machines; it will contain no parts that are attracted to a magnet, such as metals. It is made of wood, mattress foam for cushioning, and the positioning aids will be made similar to pillows filled with cotton fiber. There was many difficulties obtaining desired parts needed for the project and a lot of alterations were made.

The total estimate cost of the project is approximately $785.

Insert Figure 29

Figure 29: Cad drawing of the transferring frame (Isometric view), the tracks and two long ram jacks are not shown.

Insert Figure 30

Figure 30: Design of the positioning mat and body segment aids that will be placed as the seat on the transferring frame, it will be able to be transformed from seat to bed.

Insert Figure 31

Figure 31: Positioning mat layout