CHAPTER 10
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THE E-RACER: A GO-KART FOR A CHILD WITH CEREBRAL PALSY

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INTRODUCTION

The E-Racer, shown in Figure 10.1, is a modified electric go-kart which was designed for a child with cerebral palsy who wanted a go-kart that he could use safely with his friends. The client has no use of his legs and very limited use of his left arm, so the controls had to rely solely on his right arm. Also, the client currently uses a wheel chair controlled by a joystick, so the E-Racer has joystick control. Additionally, the client requested that the go-kart be able to be controlled by a steering wheel. Thus, the E-Racer has two modes of operation, steering wheel and joystick, which is unique to this go-kart. The E-Racer also offers several safety features not found on standard go-karts, including those designed for children with disabilities.

Fig. 10.1. The E-Racer.

SUMMARY OF IMPACT

The E-Racer is designed based on criteria given by the client, the client's parents, and the client's physical therapist. The client requested a go-kart which allows him to have fun with his peers. The client's parents further requested that the go-kart have certain safety features. The client's parents wanted the go-kart to have an adequate safety harness, a seat that provides lateral support and a way to support the client's head while riding. The E-Racer allows the client to enjoy recreational time just as he would if he did not have cerebral palsy. The E-Racer provides the client with a fun vehicle, as well as increased self-confidence and a feeling of independence.

TECHNICAL DESCRIPTION

Per request of the client, the E-Racer has two modes of operation. The switch between the two modes is at the rear of the go-kart to ensure that the rider does not accidentally hit it during operation. The steering wheel is the steering wheel from the stock go-kart, but has modifications. The modified steering wheel

Fig. 10.2. Modified steering wheel.

is shown in Figure 10.2, and included switches between forward/reverse, training/normal modes, and the braking/acceleration control for when the joystick is in steering wheel mode.

A joystick is located on the right side of the stock go-kart. The joystick controls acceleration, braking and steering when the go-kart is in joystick mode, and is pictured in Figure 10.3.

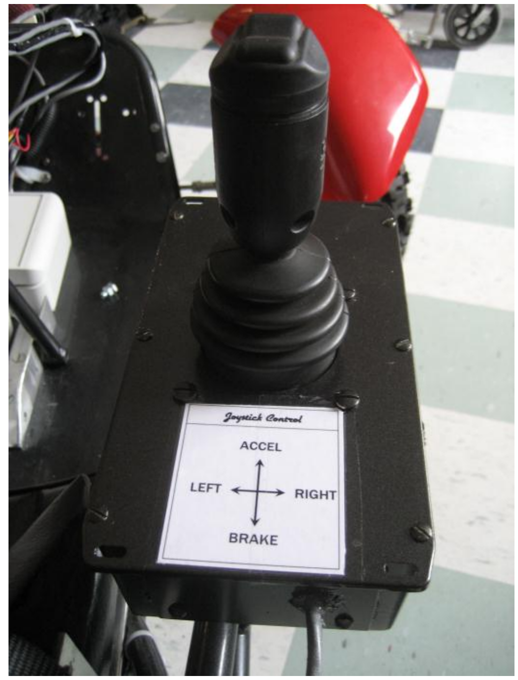

Fig. 10.3. Joystick on the E-Racer.

The electronics on the go-kart are heavily modified from the unit purchased. The braking and steering are controlled mechanically on the stock go-kart, but needed to be modified and controlled electrically. This is accomplished by adding two linear actuators to the go-kart, one for braking and one for steering. The steering system also required the use of a linear position transducer, and several small mechanical parts machined for the braking modifications. Several circuit boards are used to receive signals from the joystick or steering wheel, and then control the go-kart accordingly. These circuit boards included a speed controller for the steering system, a speed controller for the braking system, and a printed circuit board (PCB) designed specifically for the E-Racer, which includes several microcontrollers and other electronic components. The acceleration is controlled by a motor controller connected directly to the motor.

The E-Racer is an electric go-kart, and is therefore battery operated. The stock go-kart had a 36 V battery to control the motor. As a result of the modifications to the go-kart, including the addition of extensive electric components, a supplemental 12 volt battery was added to the go-kart. Each battery has its own charging port and circuit breaker. The batteries are pictured in Figure 10.4.

The total cost parts and material for the E-Racer is approximately $1500.

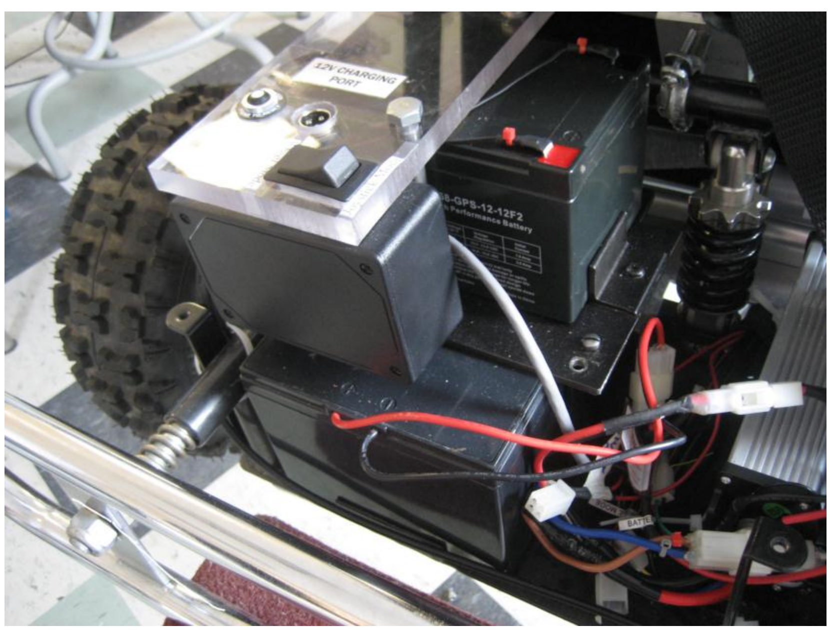

Fig. 10.4. The 36 Volt and 12 Volt batteries.

BACKPACK LEVER ARM SYSTEM

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INTRODUCTION

An innovative biomedical device is required to aid Mason, an eight-year old child with cerebral palsy. Mason has a functional right shoulder/arm/ hand, capable of a wide range of motion and fine motor skills. However, his trunk is weak; but he can sit, if properly positioned, upright in a regular chair for some time before tiring. He has trunk supports on his wheelchair to assist him with fatigue. It is very difficult for Mason to obtain his backpack that is usually hung at the back of the wheelchair. The device built here is an electrically operated lever arm, capable of moving the client's belongings to an accessible position. The design makes use of the client's functional right arm. A simple 'ON/OFF' switch will control the movement of the three limbs of the lever arm system, which will sequentially unfold to obtain the position desired. The first Limb is securely fastened to the back of the wheelchair. Limbs 2 and 3 rotate (in that order) in a counterclockwise fashion upon client stimulus to bring the backpack into the position desired. In a position of non-use, the limbs fold into a compact position at the rear of the client's wheelchair.

SUMMARY OF IMPACT

This device brings independence to any client who wants it. Clients who live by themselves will benefit from the ability to transfer object to a position where they can use them. This device is catered to a specific client and is used to move a backpack to a comfortable position for him. However, it is definitely possible to diversify applications using the same basic concepts. A transfer device can be used in the home, office, workplace, or educational facility.

TECHNICAL DESCRIPTION

The backpack lever arm system consists of 3 limbs, where two of them (Limb 2 and Limb 3) are moved by Servo Motors Arms (using Pulse-Width Modulation) for the desired motion. Complete motion of the lever arm system is 270 degree rotation of Motor 1 (the HSR-5995TG) and 90 degree rotation of Motor 2 (the HS-785HHB). Limb 1 is fixed to the back of the client's wheelchair using movable cross-over clamps. This feature enables customization, based on the width of different wheelchairs. All three limbs are made out of sturdy 80/20 material. In terms of the Length dimensions, Limb 1 is 22 inches in Length, Limb 2 is 20 inches and Limb 3 is 10 inches. The cross-section of each limb is 1 inch x 1 inch square shaped; the 80/20 material has grooves running along the entire limb. Teflon T-shaped pieces (1 inch x ½ inch) with threaded 8-32 sized holes are placed inside these grooves, and connected to the motors arms to allow for rotation. The limbs are connected via two hinges. Each hinge is made up of two L-shaped aluminum pieces, a solid aluminum block, a bearing, brass sleeve, two Teflon washers, and a single ¼-20 hexagonal head screw.

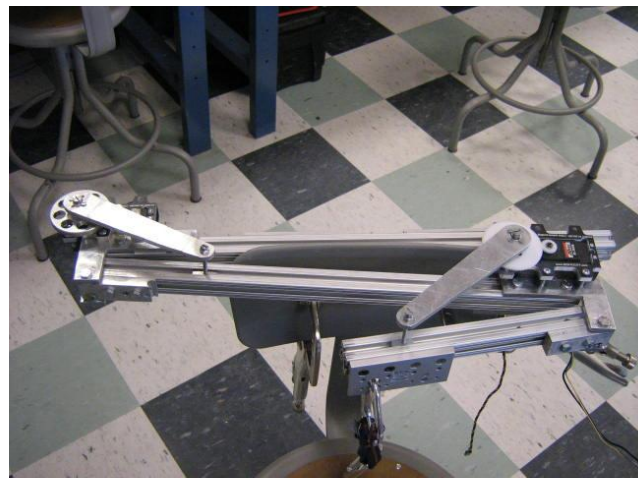

Fig. 10.5. Backpack lever arm system.

To describe the functioning of the device in sequence, it starts with a user stimulus. When the switch located on controller (which is attached by a Velcro strap to his right arm chair) is turned, the servo motors to rotate the lever arm. First, Limb 2 rotates about hinge one 180 degrees in a counter-clockwise direction from the folding position. Then Limb 3 rotates 270 degrees counterclockwise about hinge two to the right of Limb 2 to form an L-shape. After that, Limb 2 rotates once again about hinge one 90 degrees clockwise to bring the backpack that is attached to limb three as possible to the client's mid-line as possible. The final positions of three limbs after the rotations are Limb 1 remains attached to the back of the wheelchair, Limb 2 is 6 inches directly above the right arm rest, and Limb 3 is in front of the user with the backpack attached to it. After Mason finishes obtaining his belongings from the backpack, he will simply turn the switch to the "OFF" position to reverse the rotational motions of Limb 2 and Limb 3 to bring the lever arm to a collapsible position at the back of the wheelchair.

Controlling the systematic movements of the device involves a PIC microcontroller and an optimal electrical circuit to run two servo motors. In terms of the circuitry and the manner in which the PIC is connected to various important components, pins 32 and 11 are VDD pins, which connect to the 5 V power supply. This is controlled by a voltage regulator. Pins 31 and 12 are VSS, and connected to ground. Pin 33 connects the forward/reverse switch and the LED to make sure that the PIC is powered and has a program on it. The MCLR pin (Pin 1) connects to a switch, which is used to turn the entire device on or off. Pins 13 and 14 are the oscillators; externally, these are connected by a 4 MHz crystal. Finally, Pins 16 and 17 (RC0 and RC1) are connected to the signal input parts of the motors. In addition, the motors individually must have connections to the power supply and ground. The following is a schematic of the circuit.

The costs of the parts/materials for this project were approximately $750.

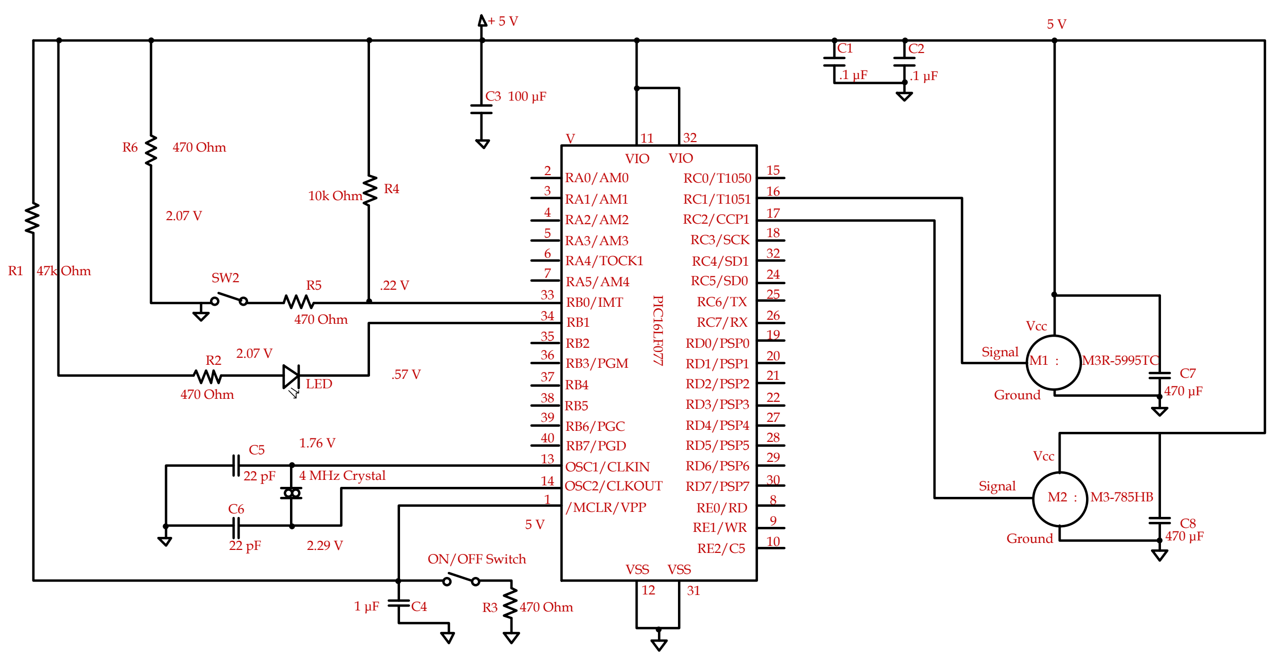

Fig. 10.6. Schematic of the servo motors control circuit.

SHAMPOO & CONDITIONER IDENTIFICATION DEVICE

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INTRODUCTION

The Shampoo & Conditioner Identification Device is designed to aid an elderly client, Mrs. Smith, who faces reduced visual perception, and substantial memory loss. The client is unable to differentiate between products within the household, and wishes to maintain her independence by using a device that helps make this distinction. Specifically, this assistive device is used to help in identifying shampoo and conditioner bottles in the shower. Fundamentally, the device is a waterproof 'talking' belt, customizable to different size bottles via a water proof iPod strap/holder. It outputs 'Shampoo!' or 'Conditioner!' upon a push of a button.

SUMMARY OF IMPACT

This product can be used for patients with low visual acuity, which may be caused by a disorder, or during healing time after ophthalmic surgical procedures. Patients (especially those that are single) may need temporary assistance in recognition of items within their household. Thus, a device such as the shampoo/conditioner identifier provides assistance in doing so. The current project is catered to the identification of specific bottles of hair products for use in the shower. However, it is possible to diversify applications using the same concept. A recognition device can be used in the kitchen for beverage bottles or food containers.

TECHNICAL DESCRIPTION

The Shampoo & Conditioner Identification Device consists of a voice-recorder player, which plays a pre-recorded message (outputted through a small attached speaker) when activated. The audio output is amplified by a circuit to ensure that the client is able to hear the message clearly. A large button located on the circuit serves as the activation point. The amplification system used is based around a

Fig. 10.7. Shampoo & conditioner identification device.

Speaker Peripheral Module made by Digilent INC. This system is based around an LM4876 audio amplifier. The LM4876 is a single audio power amplifier capable of delivering 1.1W of continuous average power to an 8Ω load. This amplifier runs on a voltage range between 3.3 and 5 V. Like other audio amplifiers in the Boomer series, the LM4876 is designed specifically to provide high quality output power with a minimal number of external components. The following is a schematic of the amplification system provided by Digilent INC.

The device operates on two AAA batteries included with the device. The two AAA batteries are housed in a battery holder connected by a pair of wires on the circuit board. All the electrical components are sealed air tight in a thin layer of plastic. However, the battery holder was left open for easy access when changing the batteries.

The entire circuit is placed into a water proof iPod Pro Armband. The iPod Pro Armband is made for use in swimming or diving. The armband is made from superior quality neoprene. Neoprene is a type of synthetic rubber that is often used in applications that require water resistance such as wetsuits and hoses.

The cost of the parts/materials for this project is $450.

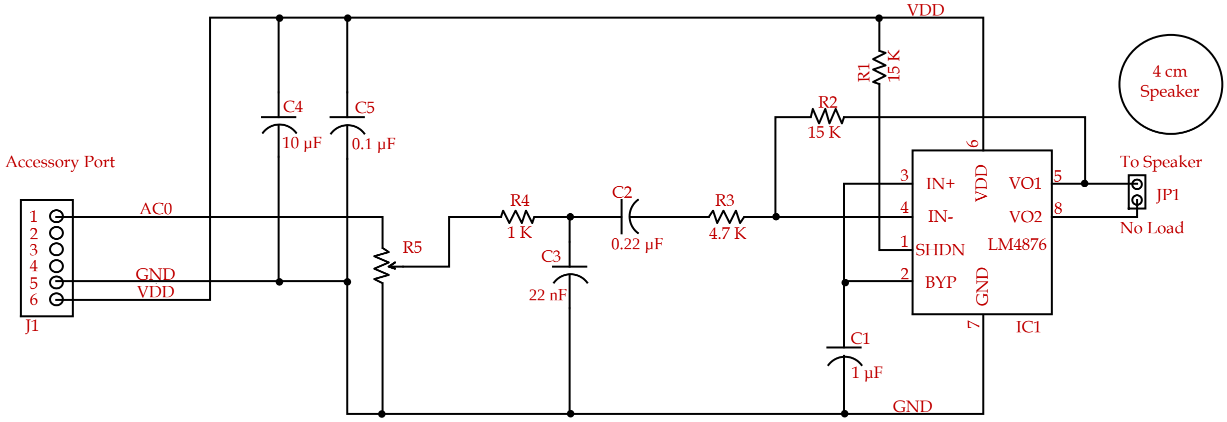

Fig. 10.8. Schematic of the amplification system (Digilent INC.).

Fig. 10.9. Insulated circuit and the battery holder.

THE ASSISTIVE ROBOTIC ARM

Designers: Alon Dagan and Michael Khalil
Client Coordinator: Merriam Kurland, Speech Pathologist, Hampton Elementary School, Hampton, CT 06247
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INTRODUCTION

The assistive robotic arm is a device developed to aid a child with cerebral palsy. Cerebral palsy is a debilitating disease that affects the portions of the brain necessary for fine motor control and stability. As this illness does not affect mental capacity, children can become quite frustrated with the inability to control their own limbs. The discrepancies between the client's mental and physical capacity can cause a great deal of anxiety and stress. Our client has difficulty typing, eating, and interacting with other students. While he has an aide who helps him in class, he feels a lack of independence that affects his self-esteem. The robotic assistive device helps bridge this gap between physical and mental abilities for the client.

SUMMARY OF IMPACT

The assistive robotic device reduces the client's frustration and provides greater independence. The assistive robotic arm acts as a third limb for the client, translating his gross motor movements into fine motions. It is hoped that this device reduces some of the frustration in the client's life and also give him a greater sense of independence.

TECHNICAL DESCRIPTION

The assistive robotic arm is comprised of a three major mechanism that mimic the function of the shoulder, elbow and the wrist. The shoulder movement is emulated using a servo motor base. This motor rotates the entire robot arm 180 degrees and provides the client with a full range of motion to grab objects off his tray or a neighboring desk.

On top of the shoulder mechanism is an elevator mechanism that helps elevate the arm. The arm is capable of increasing 6 inches in its height so that he will be able to elevate various objects that he might be using in his class and aid in his final goal of gaining independence. The main component of the elevator mechanism is a linear actuator (motor) that is be capable of lifting the elbow portion of the arm to the motors maximum stroke length of 6 inches.

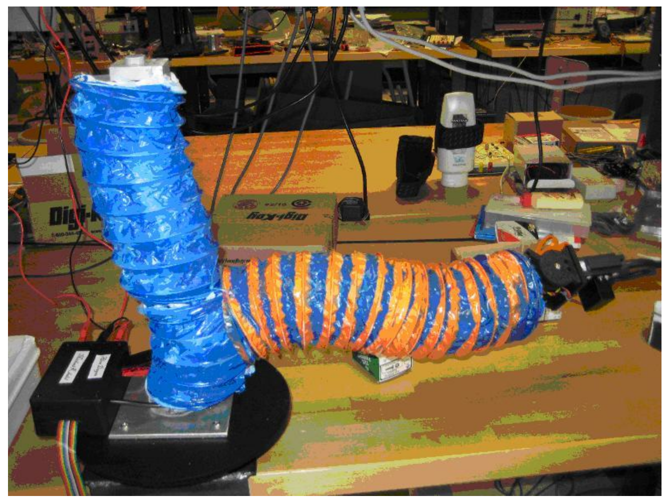

Fig. 10.10. The assistive robotic arm.

To mimic the elbow, the assistive robotic arm has a mechanism controlled by a processing unit that is capable of taking X,Y coordinates and converting it to angular coordinates for the elbow. This way, the movement of the 2 segments of the arm attached to the elbow compensate for each other when they move. The processing unit sends a pulse width modulation signal to a servo motor at the elbow, which determines the duty cycle for the servo motor and allows it to move the segments of the arm to a desired length.

The operation of the wrist rotates the grabber based on an input from the joystick controller by the client. The wrist is capable of panning and tilting to aid the client in picking up objects regardless of height off of the ground. It is capable of mimicking the flexion/extension and the abduction/adduction functions of the human wrist.

The gripper mechanism consists of a vise-like grabbing component connected directly to a motor. Within the vise is a pressure sensor that communicates with the pressure sensor cutoff circuitry. These components work together to allow for a sturdy grip that does not endanger the client or his peers. An end effector, called the "Big Gripper", was purchased as the gripping mechanism for the assistive robotic arm. The gripper's fingers measure at 3 inches long and open wide enough to grasp a 12 oz. tennis ball. The body of the gripper is comprised of a rugged but lightweight PVC plastic.

The cost of parts/material is approximately $70.

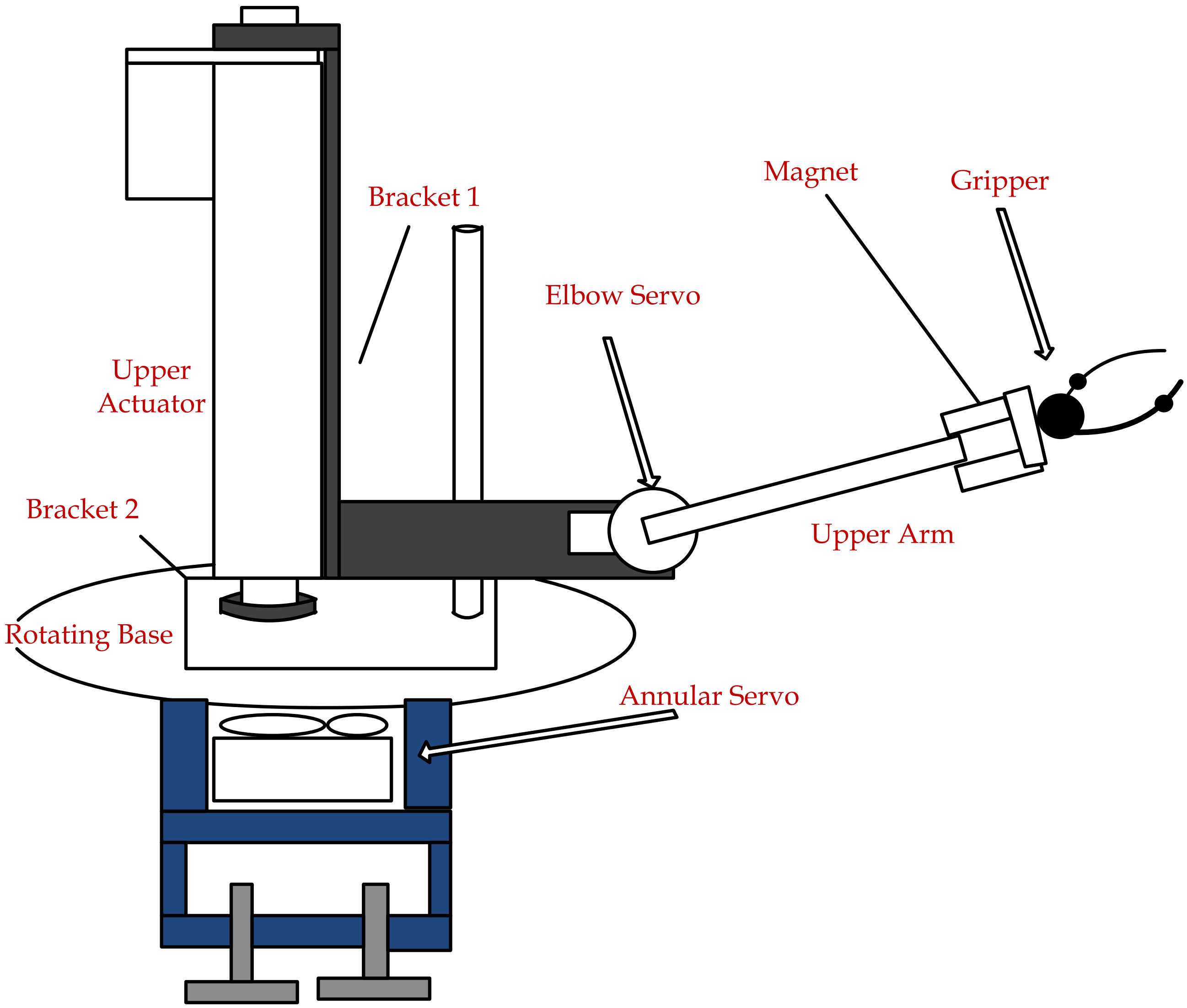

Fig. 10.11. Drawing of the assistive robotic arm.

ALTERNATIVE MOUSE INPUT DEVICE: PROVIDES ALTERNATIVE INPUT DEVICES FOR ADAPTIVE COMPUTER CONTROL

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INTRODUCTION

The alternative input device is designed to improve the speed and accuracy of the multiple users over daily use. There are two devices, an optical track ball mouse and an optical foot mouse. These two devices aim to help those with limited mobility. Along with the two devices are a set of computer games, intending to improve the navigation skills of the user. Current products are offered but are not aimed at improving the skills of persons with disabilities. Our design focuses on the strengths of the user, specifically lower extremity movement for the foot mouse, and small movement of the hands.

SUMMARY OF IMPACT

The design focuses on the needs of two types of clients. For those with limited upper extremity movement, an input device that makes use of the foot is designed. For those with limited lower extremity movement, an input device that makes use of the hands is designed. By having two different input devices, a user can practice on each device, improving skills and coordination on both devices. Two devices also allow two separate users to practice at one time. The games provide the interface for improving the skills before the user is ready for more advanced interface control.

TECHNICAL DESCRIPTION

The optical foot mouse is composed of three main parts, the foot mouse, the pedal switches, and the base. The foot mouse is composed of ¼” thick Plexiglas. This houses an optical mouse base and the circuitry inside of it. Attached to the foot mouse is a Velcro strap to be used to secure the user’s foot onto the foot mouse. The pedal switches are momentary contact switches that operate the right and left clicking functions of the foot mouse. The pedal switches are mounted to the Plexiglas base along with a mouse pad for scanning of the foot mouse. The foot mouse connects to the pedal switches using wires that are secured to the base. The connection to the computer is through a USB port, which extends out of the foot mouse.

Fig. 10.12. Final alternative input devices, foot mouse(top) and track ball mouse(bottom).

The track ball mouse also has three main components, the track ball box, the track ball and its base, and the two contact buttons. The housing of the track ball mouse is a hard polymer plastic of dimensions 9 ½” x 6 ¼” x 3 ¾”. Holes have been punched and milled out of the top of the box to allow the fitting of the buttons and track ball mouse. The next component is the track ball and its base. The track ball is a 4 ½” Atari track ball which has been painted blue and yellow for scanning purposes. The base that holds the track ball is a steel cylinder with three washers welded on top. Placed on these washers are three ¼” ball bearings, which allow for a smooth rolling surface for the track ball. Mounted on the steel cylinder is the optical track mechanism. The last components are the two 1 inch contact buttons that provide the right and left clicking functions for the mouse. These buttons are wired to the optical scanning mechanism and the mechanism connects to the computer via USB connection.

The last parts of this project are the two interactive games. These games are designed to focus on the coordination and speed of the user while using the input devices. The first game is a “hedgehog” game in which the user clicks on various objects to make them disappear before time runs out. As the user progresses through the game, the difficulty increases as more objects enter the screen, the background changes, and the speed of the objects increases. The second game is a brick breaker game in which the user uses a paddle to ricochet a ball towards various colored bricks to destroy them. As the user progresses through the game, the speed of the ball increases, the brick arrangement changes, and the amount of the bricks increases. Also, bonuses are included in the game, which include adding another ball into the game.

The cost for the parts/material is approximately $250.

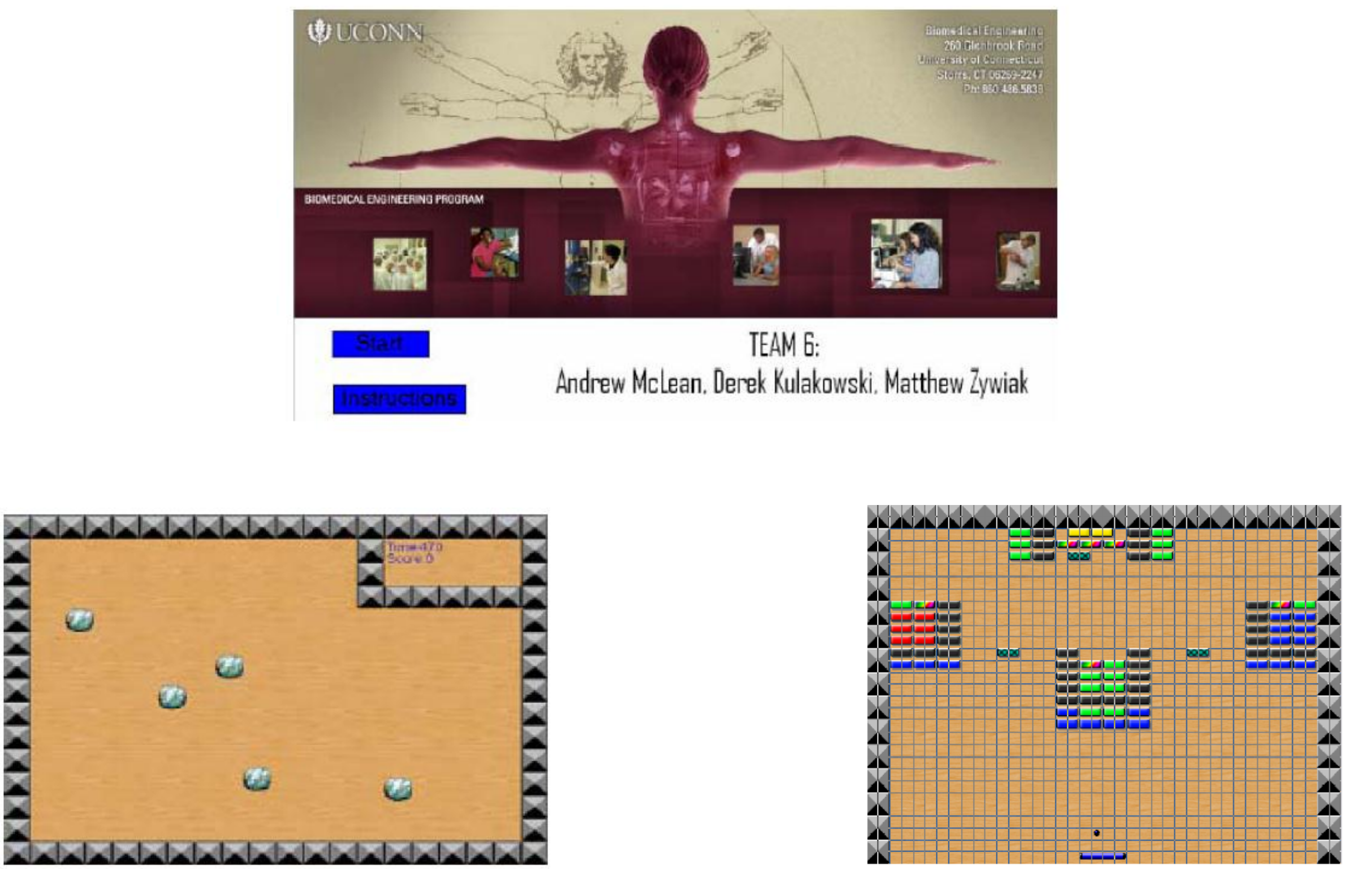

Fig. 10.13. Gaming interfaces, start menu(top), hedgehog game(left), brick breaker game(right).

ACCELEROMETER CONTROLLED ART ASSISTANT

Designers: Andrew McLean, Derek Kulakowski, Matthew Zywiak
Client Coordinator: Brooke Hallowell, Ohio University, Athens, OH
Supervising Professor: Dr. John Enderle
Program Director & Professor for Biomedical Engineering
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INTRODUCTION

The Accelerometer Controlled Art Assistant is designed to allow persons with limited upper body motor control to draw. This device is simply an X-Y track system composed of two worm screws (see Figure 10.14). These worm screws are driven by DC motors that are controlled by the client. The drawing utensil is moved up/down, left/right depending on which motor is activated. Motors are activated based on signal from two accelerometers, which detect changes in pitch and tilt. Ultimately this device will give the user a sense of interaction and control when drawing.

SUMMARY OF IMPACT

A client with limited upper body motor control wishes to draw and paint. The device described here gives this capability to the client suing writs accelerometers. Drawing and painting is a good way to stimulate the senses and this device allows the client to take an active part in their art creations that stimulates cognitive senses as well as stimulating the visual and auditory senses. While this device needs assistance in setting it up, after this, the client can completely control the device to draw and paint.

TECHNICAL DESCRIPTION

The structure of the X-Y track system is made of several components. The self-manufactured worm screw, motor mounds and drawing cart are all made of aluminum. Aluminum is characterized by a high strength to weight ratio, providing the necessary strength for the mechanism, while minimizing weight. The frame of the track, as well as the purchased worm screw, is made from steel. The high strength properties of steel provide the necessary strength to resist torsion and tension that is present in this mechanism. The final part of the structure is the hardwood backboard. This is mounted onto the steel frame; the hardwood is relatively light and does not add much weight relative to the rest of the mechanism. While the mechanical properties of the hardwood are not as good as the various metals in the system, it still has more than enough strength to support the art paper and the force from the drawing utensil.

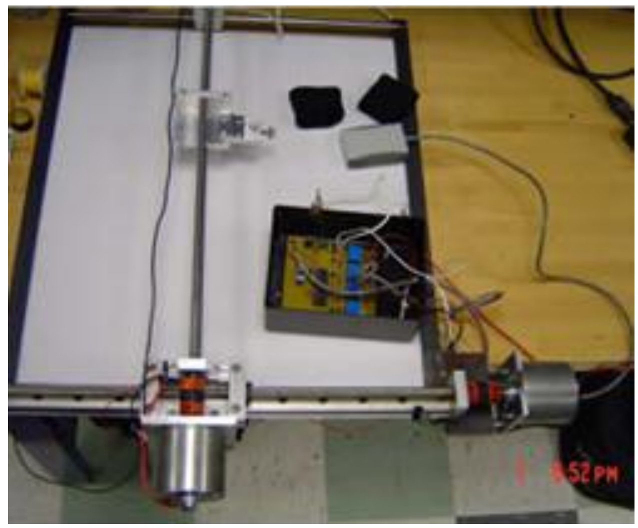

Fig. 10.14. Complete art assistant.

Attached to each wrist of the user is a Mesmic duel axis accelerometer. These accelerometers operate on a 50% duty cycle when horizontal and a 0-100% duty cycle when tilted vertically. This signal goes through a RC circuit to reduce the duty cycle into a single output voltage, which varies +.5 volts when tilted. This signal is processed by the PIC16877A microchip. There is a set voltage thresholds programmed into the PIC, that, if they are surpassed, the PIC sends a signal to designated pins. Voltage thresholds are surpassed when the accelerometer is tilted greater than 45 degrees. If the voltage is within the horizontal range, then no output is given.

The PIC alone cannot provide sufficient current to the motors and makes use of voltage relays. This allows the PIC to control the forward and reverse directions of the motors. The circuit diagram for this device shown in Figure 10.15.

The relays wired to the motors are attached to the worm screws on the X-Y track system. Each worm screw is powered by a 12V reversible DC motor. These motors, on average, draw a current of 3A. The reason 12V DC motors are used is because of cost and fine movement is not required. At the end of each track are micro switches that turn the motor off. These switches are used to ensure the motor does not continue to run when it reaches the end of the track system.

The total cost for all the components is approximately $750.

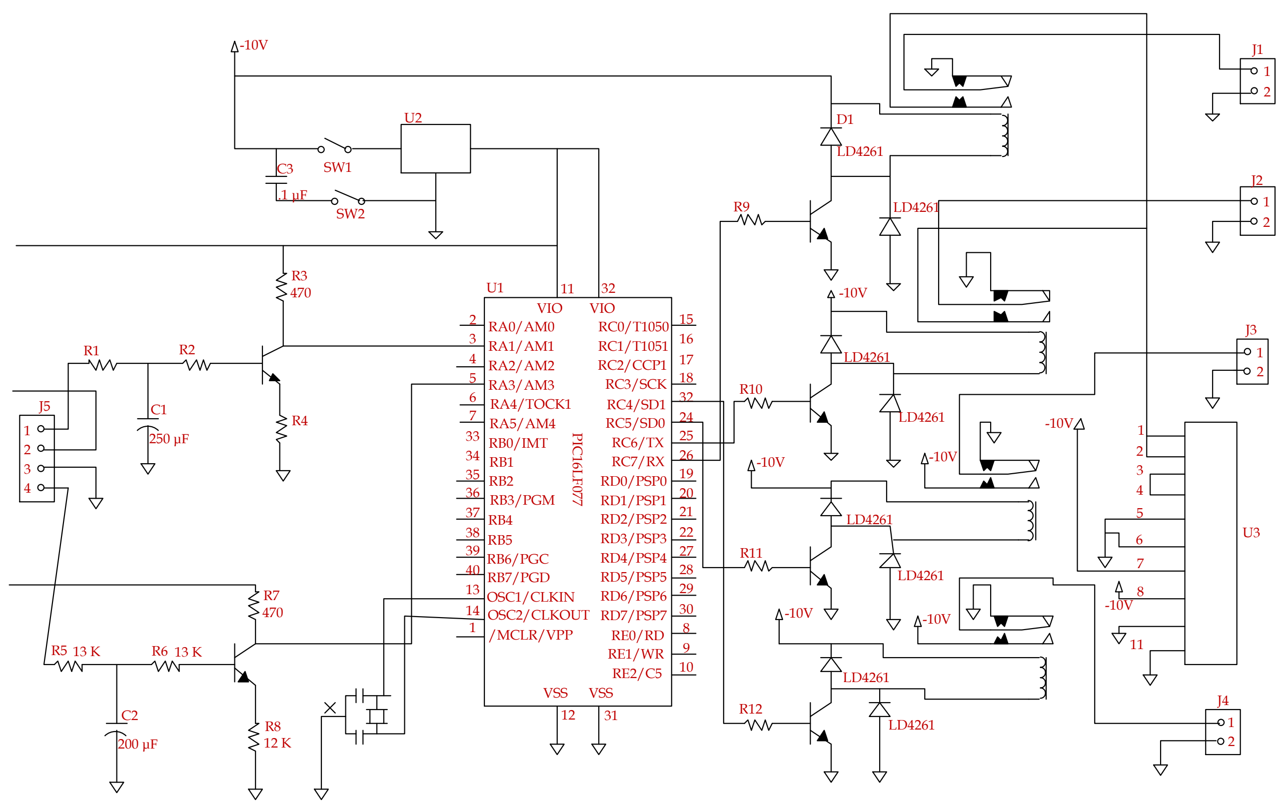

Fig. 10.15. Circuit diagram for art assistant.

GAME FOR IMPROVING SPEED AND ACCURACY OF NAME RECALL

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Client Coordinator: Brooke Hallowell, Ohio University
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INTRODUCTION

The Game for Improving Speed and Accuracy of Name Recall is designed to help individuals with cognitive disorders, such as Dementia and Alzheimer's. Often, these individuals have trouble remembering the names and faces of family and friends. The purpose of this project is to allow these individuals to practice naming friends and family so that when they interact with these people, they are able to recall the names and faces. The game

Fig. 10.16. The multiple choice game screenshot.

consists of three main screens, the Main Screen, Game Screen (see Figure 10.16), and Load Pictures Screen. The computer game includes voice recognition for elderly users who are not familiar with a computer.

SUMMARY OF IMPACT

The design criteria for The Game for Improving Speed and Accuracy of Name Recall are that is it be easy to use and stimulating. To accomplish this, the game is made to be simple to use for individuals who are not computer users, thus eliminating the use of large navigation menus. Further, voice recognition is used while playing the game for ease in use. The game is also stimulating and challenging.

TECHNICAL DESCRIPTION

The computer game is written in Visual Basic, a part of Microsoft Visual Studio developer suite. To allow for integration of the voice recognition software, another Microsoft Software Development Kit is used. This kit contained a Speech Recognition Engine along with documentation. Visual Basic used the Speech Engine so that the code is used in the program to recognize spoken words as input and convert them into text that the program used.

Three main functions are used to create the game environment. The SpeechInitialized function initializes all of the variables needed within the game and sets up the speech engine to begin receiving information from the headset. A headset is used to improve sound quality with a digital signal. Analog signals are often subject to distortion which digital signals are not.

The second function is the RebuildGrammar function, where words entered into the game are placed inside the grammar unit of the Speech Engine and used to create recognizable words.

The third function is the SpeechRecognized function, which recognizes words that are turned into text that is then used to drive the game with the appropriate response.

The actual coding of the game is done with standard Visual Basic language using event driven programming. This means that events happen on the screen only when certain buttons are pressed by or by events taking place not visible to the user.

A game feature allows individuals to save long lists of names and pictures without having to enter them every time they began a game.

The cost for this computer game was negligible. All programs and devices were provided by the University of Connecticut.

MONITOR LIFT FOR ADJUSTMENT OF COMPUTER DISPLAY

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INTRODUCTION

Often, neurological disorders result in impaired auditory and visual sensory function. Communication with a person with a neurological disorder is sometimes difficult because of their inability to express the extent of their disabilities through traditional means. Neurological disorders that some patients experience spans all areas that affects mental comprehension, physical mobility, and all means of communication. Level of comprehension is difficult to known because of their inability to respond after receiving an input, say, a visual stimuli from a computer. This project improves a system designed for communication with persons with neurological disorders by changing the height of a computer monitor for ease in use.

SUMMARY OF IMPACT

The device created is simple to use and does not distract the client. The environmentally friendly nature of this device makes it appealing in the day to day use. The speed is fast enough that is does not take an excessively long time to lift the monitor 12 or more inches.

TECHNICAL DESCRIPTION

The Monitor lift raises a 27 inch flat panel monitor 12 inches off of the table surface and then back down. The monitor lift is extremely easy to use. It has a footprint of 18″ wide and a depth of 24″. The platform sits flush on top of a desk. The monitor lift itself weighs only 32.4 lbs., so it is very easy for it to be relocated if necessary. The monitor lift's design, especially the shape and size of the platform, provides excellent stability, so no clamps, straps or other securing devices are necessary. It simply rests on top of the desk's surface. Rubber grips on the bottom of the aluminum platform keep it in place and prevent any possibility of the monitor lift sliding around on the desktop.

Once the monitor is attached to the mount, the monitor rests approximately 0.7″ above the surface of the platform at the lowest height and is level with the desktop. To operate the device, the practitioner uses a DPDT switch to raise the monitor up or down. It defaults to the 'off' setting, which is the middle position. Labels clearly indicate which way to hold the switch to move the monitor up or down. For safety reasons, the lift operates only while the switch is being held one way or another.

An internal limit switch keeps the shaft from rotating outside of its 18″ movement range. If the momentary switch is held in the downwards position when the lift is already completely lowered, the limit switch prevents the actuator from being damaged or getting locked up. The same is true for the upper limit of the shaft range. If the switch is held in the up position when the actuator has already extended the full 18″, the internal limit switch prevents it from moving any further.

The adapter supplies the monitor lift with a 9V power source.

The cost of parts/material was about $450.

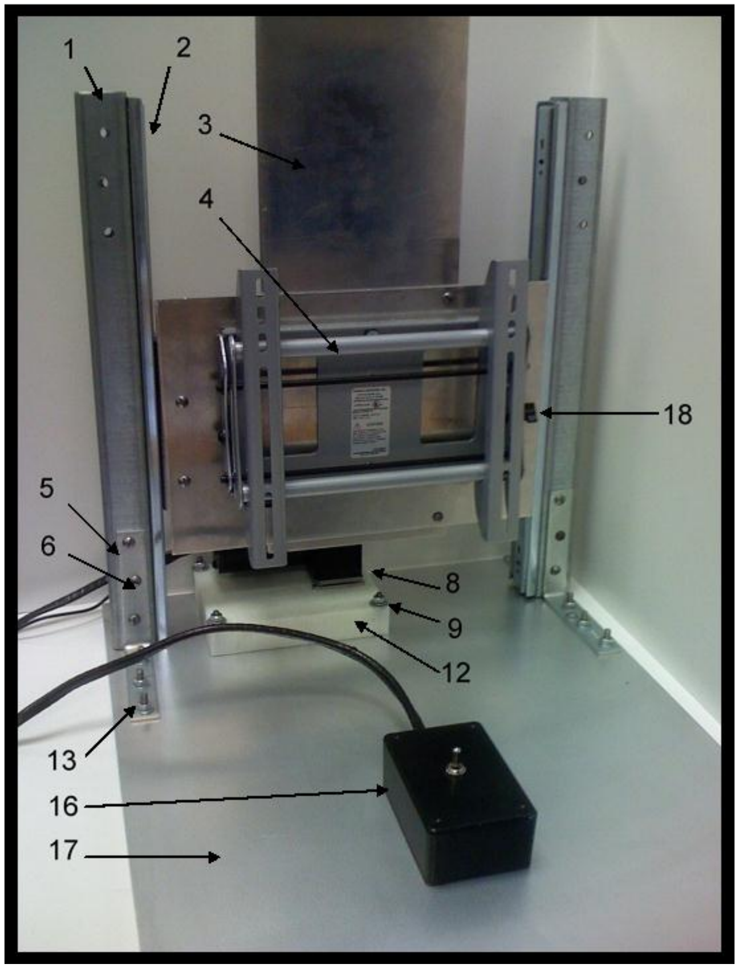

Fig. 10.17. The monitor lift.

PAINT CAP REMOVER

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INTRODUCTION

Multiple Sclerosis (MS) is a chronic inflammatory disease that affects the central nervous system by damaging the myelin sheath of neurons. Our client is an artist with MS who would like to continue to paint but is unable to because of his difficulty opening paint tubes. He has loss of function in one hand, and an overall strength loss in the other hand.

SUMMARY OF IMPACT

Approximately 250,000 to 350,000 people in the United States have MS, which typically occurs between the ages of 20 and 40. The paint cap removal aid designed for our client has had a great impact in his ability to paint independently, without the need for someone to open his paint tubes. The ultimate goal of the paint cap removal device is to provide our client the maximal convenience and

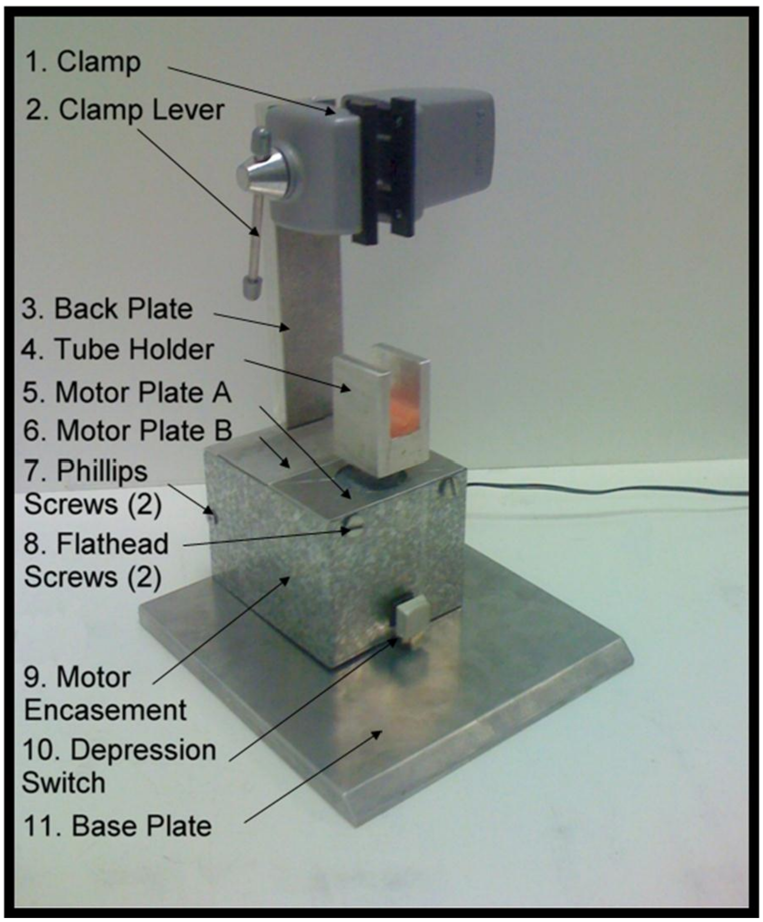

Fig. 10.18. The oil paint cap remover.

comfort in his working environment that requires minimal strength, is easy to operate, and is compact.

TECHNICAL DESCRIPTION

This paint cap removal aid is designed specifically for Grumbacher 1.25 oz. oil paint tubes. However, any tube of the same general geometry and size will fit this device. In addition, caps with different designs, such as round with teeth versus round with no teeth, are easily removed with this device.

Grumbacher recently began to make smooth cap heads for their paint tubes without the distinctive teeth as previously produced. The paint cap removal aid is designed to accommodate both of these cap styles.

Figure 10.18 shows the paint cap removal aid. It operates using a motor and requires a typical wall electric outlet.

The paint cap remover features a momentary switch located just above the base. The switch allows the motors to spin when it is manually depressed and held there. The location of the switch is key- it promotes safety and easy use of the device. It is located far enough away from any moving parts so that fingers will not contact them and it is located close to the base surface so that the user can rest their hand on the surface while holding the button.

Our client can remove the cap from a paint tube in three easy steps. First, the tube is placed in the tube holder. Second, the vise is closed, which can be done by simply hitting the lever; it does not need to be tightened with any significant amount of force. Third, push the button to remove the cap.

The cost of parts/material was about $110.