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(54) Titre : PAVE TACTILE INTRA-BUCCAL
(54) Title: INTER-ORAL TOUCHPAD

(57) Abrégé/Abstract:
The device is an internal-oral computer touchpad which is used by an individual to control a computer cursor. The device is intended to allow quadriplegics and other individual with severe disabilities to gain independence by interfacing with computerized devices. The touchpad acts as an oral prosthetic used for communication; the device rest within the patients mouth without impeding airflow or other bodily activities. The device rests securely within the small cavity existing between the upper jaw (and teeth), the lower mandible (and teeth), and the cheek tissues. The prosthetic which incorporates a touch sensitive touchpad encased in a watertight casing, is placed in the mouth with the touch sensitive pad sequestered vertically between the outer teeth and the inner cheek tissue. With the teeth parted slightly, the tongue is able to contact the exposed touch sensitive surface of the touchpad; completing the circuit which transmits an electrical signal to the computer and moves a cursor. The touchpad also has one or multiple buttons integrated to the casing to enable cursor clicking and alternate functions. The device is attached through a ps/2 or USB cable to a computer. The description, together with the claims, forms the bulk of your patent application. It is here that you give a full account of your invention. The description begins with background information relevant to the invention, and describes the invention in increasing levels of detail. One of your goals in writing the description is to compose it so that someone skilled in your field would be able to reproduce your invention just from reading your description and looking at the drawings.

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Petition to the
Canadian Intellectual Patent Office

Patent Title: Inter-Oral Touchpad

Revision	Date	by	Abstract
1.1	17-08-2010	Matthew Osterloo	**The device is an internal-oral computer touchpad which is used by individual to control a computer cursor. The device is attached through a ps/2 or USB cable to a computer. The device is intended to allow quadriplegics and other individual with severe disabilities to gain independence by augmenting computerized devices.**

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Confidential Information Notice: The information contained in this document is confidential and proprietary to Matthew Osterloo

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BACKGROUND OF THE INVENTION

Touchpads are well-known input devices for digital systems including personal computers, games, hand held personal organizers, POS units, and the like. Touchpads operate by detecting the presence and movement of a pointing element manipulated by a user, e.g., a pen, a stylus, or a user-finger. Detected pointing element movement is translated electronically into movement of a cursor on a display screen, into commands, or other input that is recognizable by a machine or device with which the touchpad is used. Generally, a touchpad assembly includes a touchpad, a cable, a printed circuit board assembly (PCBA), a support lens, and a shield over the top of the assembly.

Using existing touchpad's, individual living with various disabilities meagerly benefit from touchpad technology. If coated in a water resistant material and fully water proofed, touchpad's, can be augmented to be repositioned into various bodily orifices such as the mouth. Few devices have been engineered to be water resistant and to interface with the users tongue to permit computer access, while mounted on the side of the human mouth.

The closest similar device found through a patent search is *U.S. 7071844,* which is a mouth mounted input device which is fitted to the roof of the human mouth. The device resembles a dental retainer in shape and form. The device being propositioned within this patent application differs compared to this American patent in that the device being recommended here is housed in the cavity between the jaw and the cheek (Image 1) and not fitted to the top of the mouth against the pallet (although the device can be moulded and positioned against the pallet). Second, the device proposed here does not include a "the stimulator provides pulsed electrical stimulation to the mouth to present alphanumeric information"[1]. Thirdly, the device proposed within this application does not have a central processing unit included as does *U.S. 7071844* as stipulated in claim 7 of the associated patent application. Lastly, the touchpad being used in this patent application is not curved and is flat.

Further patents relating to this proposed patent include KR20040065974 (A) – EU hiding touchpad to prevent inflow of water, and WO03060680 (A2) - RUGGEDIZED, WATER SEALED, SECURITY-ENHANCED TOUCHPAD ASSEMBLY. Both of these patents apply to laptop mounted touchpad's and are intended to make laptops more durable and resistant to moisture and user abuse. They often take the form of structural changes to laptop wrist guards

[1] http://www.patentvest.com/console/reports/docs/grant/07071844.html

(KR20040065974) or resin injection to prevent theft and food spillage as detailed in the invention background of device WO03060680.

The proposed device has augmented an existing and widely applied device to a new application which targets a new and specific consumer base. This device particularly targets individuals with mobility impairments and lack of bodily control. It targets a sub-section of the disabled community by being intended for individuals with only limited tongue mobility such as quadriplegics and *Amyotrophic Lateral Sclerosis* (ALS/ Lou Gehrig Disease) patients, whom have often lost most of their control over all muscle groups except sometimes for those muscles closest to the brain and higher up on the spinal cord. This device shows utility and function by permitting people with these forms of severe physical disabilities to fully operate a computer with their tongue alone. No head movement is required and neither is finger movement (the latter being the primary intended human interactive style with existing touchpad's).

The presented configuration not an obvious application of the device; in the past, companies have mounted the touchpad via stand in front of the user's lips with metal and plastic mounting arms, but this involves user head movement to move the face within proximity to the mounted touchpad, then extending the tongue beyond the confines of the oral cavity to interact with the touchpad. It is more obvious for the device to be mounted in front of the mouth than inside of it. The device proposed is mounted in a tiny, naturally occurring pocket inside the mouth, which is a truly unique notion. The device is mounted between the cheek tissue and the mandible (teeth and gums) on the interior of the mouth, and not to the roof of the mouth. It is kept in place by pressure being exerted from each side by the gums and teeth on one side and by the cheek tissues in the back. The device is prevented from slipping into the throat by the molars and the tapered tissue structures in the back of the oral cavity.

From all research conducted, no computer manufacturers, computer peripheral manufacturers or medical/prosthetic companies have yet to patent and commercially distribute this form of device; surely demonstrating its novelty and justifiable merit in receiving a patent.

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Description:

{The device was originally invented for my friend Jason Nichols who is quadriplegic and incapable of speaking due to a stoma. Due to Jason's quadriplegia and his spasms, he is incapable of using any form of electronic devices with the exception of head operated switches to control his wheel chair. I decided to develop Jason a computer peripheral that would allow him to fully use a computer. I am capable of such an undertaking due to my extensive computer background affinity for technology. I have previously been employed by York University to maintain computer equipment: as well I have been employed by the Toronto District School Board and Scadding Court Community Center to build computers for individuals living with disabilities. Lastly, through a collaborative process with my Professor Shannon Bell of York University, we opted to make completion of my project applicable to my final term mark.}

The device is intended to be an oral prosthetic that can permit computer access to individuals with minimal bodily capacity. As the oral cavity on humans is quite finite, one of the smallest commercially available touchpads was acquired. In this case it was a Synaptics© micromini touchpad, originally built and integrated into the eeePC© by Asus© Computers. The touchpad is approximately seven centimetres tall, ten centimetres long and two millimetres thick. It comfortably fits inside a male adult's oral cavity. It is to be noted that this device is not intended to sit on the pallet or against the tongue. The device is intended to rest laterally between the mandible (jaw) and the cheek with the touch sensitive surface of the PCB (printed circuit board) facing towards the tongue. When the teeth are parted, the tongue is able to move across the surface of the touchpad's sensing area, activating the conductive sensors and consequently moving a cursor on the computer screen.

Mechanical operations and assembly:

The touchpad has one surface which is flat and touch sensitive. The touch sensitive aspect of the chip transmits electrical signals to wires when it is powered. The rear surface of the touchpad is printed circuit boar, with exposed connectors, topographic circuits, and microchips. There is nothing on any of the other sides, as they are too thin (approximately 2 mm) to serve any beneficial purpose. As such only the front (touch sensitive axis) and the rear (topography and connectors) will be discussed in this application and not the sides of the chip.

The touchpad uses has a 12pin connector which was intended to transfer power as well as information between the laptop/computer CPU (central processing unit) and the touchpad topographic chipset and receptive components. The 12pin connector is located on the back of the PCB. The 12pin micromini chip design by Synaptics© and used on the Asus eeePC© is a ps/2 variant as opposed to a USB variant and thus limits its rewiring capabilities. This is important because the chip uses ps/2 configurations to send power and information and this differs from the USB protocols. The prototype model uses ps/2 protocols to transfer information through the 12pin connector. (if a computer device can not support ps/2 as it is becoming antiquated, a

generic high-end ps/2 to USB converter can be used to permit the device to function with USB only imputes).

The ps/2 wire can be changed to Bluetooth, Radio frequency, Infra-Red, USB, USB 2.0, or any other kind of proprietary or generic plug which can support signal transference. The next generation produced will probably be wireless and most likely Bluetooth enabled. The device is most promising when wirelessly connected to a computer. It is known that the device discussed herein, and the connection mediums (Bluetooth, Radio frequency, Infra-Red, USB, USB 2.0) uses compatible technology, and it should be noted that it is requested that the wireless capacity of the device be recognized as inherent to the nature of this device and patented as such here forthwith.

In order to rewire the chip into a ps/2 cord, the 12pin connector has to be rewired. The twelve leads within the 12pin connector must be rewired into six leads to be ps/2 compatible. To do this, the maker procured the proper width 12pin Flat Flexible Cable (FFC), which is .5 mm wide, from a supplier. The desired length of the wires which were purchased were twice the standard length, ensuring that each wire supplied two (2) connective ends (and essentially two fully functional wires when assembled), and that it would be the most cost effective purchase. The 12pin FFC were cut in half to lengths of approximately 6 centimetres, so each of the two ends had one end capable of mounting with a 12pin socket. A soldering iron was used to heat the plastic coating on the severed end of the FFC to remove the wires from their insulating plastic shielding. When all twelve (12) of the wires leads are cleared of plastic and exposed to a suitable length (approximately three centimetres), they have to be solder from 12 wires into six pairs of two (2) wires each. To do this, the Synaptics© manuals from the internet describes the proper wire layout (graph 2) essential to rewiring to a ps/2 pin out. As explained within the Synaptics manual, the specific chips leads are as such: leads one and twelve are the ground wires, leads two and three are the Left Switch wires, leads four and five are the 5 Volt wires, leads six and seven are the DATA wires, leads eight and nine are CLOCK wires, leads ten and eleven are Right Switch wires. The wires are soldered together to ensure proper connections are made. Care cas to be take to fold over the 1 & 12 leads and to solder them together while avoiding contact with other leads which invariably would cause a short circuit. Test circuit by using Volt Meter and battery to confirm completed circuits.

At this point the ps/2 cable is prepared. An old ps/2 mouse had the hand portion cut off to leave only an extended cable and plug. The outer wire is stripped a few inches near the severance point to reveal the internal four wires (and occasionally an additional ground wire {discard this ground wire}). These four wires were stripped as well about 1cm. A volt meter and battery was used to trace the pin layout from each pin in the ps/2 plug, to the corresponding wire within the coated cable sheath. As standard in ps/2 pin layouts: pin 1 is DATA, pin 2 is inactive, pin 3 is ground, pin 4 is Voltage, pin 5 is CLOCK and pin 6 is inactive (pin two (2) and six (6) do not have wires running from them) (insert google pictures of ps/2 pin out). Then the stripped FFC wires are very carefully soldered to the corresponding ps/2 leads to avoid connections and shorts. Once again test circuit by using Volt meter and battery. Soldering is done with silver based solder to avoid exposing customers and workers to lead and other heavy metals. When the leads are soldered together, each lead is covered in electrical tape or a similar insulating material to mimic the wire insulation in a ps/2 cord and this is intended to prevent electrical short shorting.

The ps/2 cable should now have a socket at one end, a cord which is cut and stripped,

four leads connected to a FFC cable, and at the very end the 12pin FFC connector. the buttons are created next.

Corners:

The corners of the touchpad can be filed or cut down on some chip models to make the corners of the chip more comfortable within the mouth, thus reducing the likelihood of gum irritation (image 8). The drawback to this process is that some touchpad's can not be modified in such a way as severing any part of the pad will render the whole pad or entire sections incapable of functioning. Other can only have a small section of the corner field down without recourse. It is recommended that filing of the corners be done after initially connecting the FFC to the chip socket and after a voltmeter testing of the circuit, yet before taping any wired down or gluing anything.

The button:

The button(s) upon the device was derived from a laptop computer keyboard. As there were not enough buttons readily available that was water tight, small enough to fit with the device, and cost effective enough to be beneficial, a button was adapted from a laptop keyboard. The keyboard was fully disassembled until all that was left was the thin plastic sheets with rubber nipple glued to them at the very core of the unit. The sheet discussed here, is composed of three separate thin plastic sheets. Two of the sheets have electrically conductive metal etched on one side to form a circuit. The third sheet is positioned between the other two sheets. The middle sheet has holes cut into it, to permit one conductive etching to contact the other sheets conductive etching, when force is applied to a nipple above it.

An individual nipple is cut out of the plastic sheet with a section of the circuitry beneath it. The plastic sheet is trimmed to remove sharp edges. The plastic sheet is glued to the touchpad in the desired location. A small gage wire (approximately 20 gage), about seven (7) centimetres long is stripped of its insulating plastic coating at each end (approximately one centimetre). Carefully the plastic sheets are separate and one end of the stripped wire is placed between the first and second sheet atop the electrically conductive material, making contact. The wire and the conductive etching form a circuit. The wire is bonded in place with adhesive or tape (preferably a conductive bonding agent but puperglue works as long as it does not touch the exposed metal ends, for it will cover them in glue and essentially insulate the ends!). A second wire with the same specifications is places between the second and third layers of plastic. The second wire is glued in place just as the first wire was. The other ends of the stripped wires are folded around the side of the touchpad and brought to the back of the PCB. One of the two wires is soldered to the FFC wire 2/3, while the second end is soldered to the GROUND wire (pin 3, FFC wires 1/12). All connections are covered in electrical tape or glue to ensure completed circuits and reduced risk of short circuiting.

When pressure is applied to the nipple, the downward force causes the etched material to push through the hole in the second layer of plastic, resulting in contact between the first and

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third layer of electrically conductive etched plastic. This completes a circuit which essentially travels from the chip to the button, to the ground cable, then to be processed by the computer.

If a second button is desired; the same procedure is applied using wires 10/11 as the RIGHT click and the GROUND (pin 3, FFC wires 1/12) on the FFC.

Wiring the touchpad

The native FFC connector end is then inserted into the 12pin connector on the Synaptics© touchpad and the locking mechanism as closed to prevent movement of the FFC. The FFC is bent backwards to have it positioned over the center of the chip and prevent the FFC wire from lying outside the perimeter of the touchpad chip topography. Once complete, the FFC wire is secured in place to prevent movement and disconnection from the 12pin connector (with electrical tape or another suitable water resistant adhesive). The four leads from the ps/2 cable are taped together to create one lead which looks and acts simply an extension of the mouse cable. The cable was bent to exit the perimeter of the chip from the desired side dependent on chip configuration {chips have different left, right, up, down configurations}. Lay the PS/2 wire down the center of the chip and the wire should travel off one of the short ends of the chip. This ensures that the wire can comfortably exit the mouth through the corner of the mouth with little discomfort, and does not continuously irritate the top or bottom gums. This also helps to prevent accidental biting on the wire, and helps to keep the device it in its intended position.

Once the wire is positioned it was taped down with electrical tape or an analogous adhesive. Following this task, the entire back side of the chip was taped over with electrical tape, primarily to prevent saliva from short circuiting the chip but also to prevent damage to the transistors, and to soften the corners of the device and prevent gum irritation. A few small pieces are secured over the plastic sheet on the front of the chip to make the button water tight/water resistant from saliva seepage. Test circuit by plugging into PS/2 outlet on computer.

One final layer of water tight adhesive can be applied to the back of the chip for additional saliva and water protection, and a small strip of electrical tape approximately three centimetres can be positioned over the front of the chip to limit the contact area. This second piece of tape served multiple functions: further prevent saliva leakage, prevent the gums from triggering the touch sensors and protect the teeth and touchpad from each other.

The Casing;

The casing is a crucial component of the device. It must be water resistant and also non-toxic to humans as it is exposed to the oral cavity. Thus the case can be made from a number of different elements including but not limited to: denture grade plastics, non-toxic metals (aluminums or stainless steel, titanium), medical grade later rubbers or medical grade silicone rubbers, other medical grade polymers as well as natural rubbers. The possibilities are numerous and not limited to those mentioned herein. The goal is to have a comfortable, safe and water-resistant casing for the electrical components. The way in which this patent differs from a device such as “WO03060680 (A2) - RUGGEDIZED, WATER SEALED, SECURITY-ENHANCED TOUCHPAD ASSEMBLY” is that 1) the water resistant materials are not injected to prevent theft, 2) they are not injected inside the device alone, as they comprise the casing of the herein described object, 3) the material that can be used are limited to medical grade ingredients. 4) The water sealing on WO03060680 is designed for less intensive application than

this proposed device; in that the water sealing is intended to prevent spills of finite nature such as beverages as opposed to continuous bodily secretions. The proposed device is intended to be immersed in oral liquid for extended periods of time demonstrating the divergence in the application of the water resistant capacities.

For the prototype, liquid latex rubber was used as a casing material due to its water repellent qualities. Prior to coating the touchpad and about 10 cm of cable in liquid later rubber, the area of the touchpad that would be exposed to be contacted by the tongue was to be prepared. A small round rubber ``O`` rings (about ¾ wide) was secured to the front touch sensitive portion of the chip with plasticine. The ring had enough pressure applied to it to bond thoroughly to the touch sensitive surface. Once any excess plasticine was removed, the device is ready for casing. The device is held laterally by the cord, and immersed in liquid latex covering the whole of the touchpad and about ten (10) cm of the ps/2 cord. The device was removed from latex and permitted to drip excess liquid latex back into the latex storage container. The device was then set to hang laterally for 24 to 48 hours to permit the latex to cure fully. Once the latex was fully cured, the device was immersed one more time to guarantee a water tight seal around the wires and circuitry. This layer is permitted to dry for 24 to 48 hours. A third coating is possible if desired. Once fully cured, a sharp knife is used to score the latex around the base of the rubber "O" ring. The latex is removed from the "O" ring, and the plasticine that was used to connect the "O" ring to the touchpad is also cleared away. The touchpad and latex is left to cure for another 12 to 24 hours.

When these stages are completed, the device is plugged into a computer ps/2 socket to ensure the product works. On many computers and operating systems, the computer need to be rebooted to accept the device; yet this is not universal. The device is usually automatically accepted by newer versions of Microsoft Windows due to preinstalled software drivers, but not always. If not automatically accepted and recognized as a 'human interface device', Synaptics© drivers must be downloaded to ensure the device is recognized and will operate properly.

This device can be manufactured in various different ways, substituting analogous parts such as proprietary or generic cables, transmission frequencies (Bluetooth v. Infrared) or casings.

The novelty of the device is multiple; the device is a water resistant electrical touchpad which is constructed in such a way using small scale devices that make it particularly unique. Smaller than standard laptop touchpad's, this device has taken one of the smallest commercially available touchpad's on the market and uses it as a standard fitting size for this product

The device is fully functional and operates as is expected in every regard.

Computer system for speech programs and wheelchair navigation systems

With computer technology developing over the last three decades to be affordable to the general public and bundled with user friendly interfaces, the individual that have most to benefit from their applications are often left by the wayside as their needs are vastly different from the standard users needs. Individuals with complex physical and intellectual difficulties are often those most in need of computer devices to aid their discourse and actions, yet due to a varied set of situations, the standard computer and interface is inadequate for individuals living with many disabilities. This paper will outline the development and the applicable uses of a new device that will permit more individuals to have access to computers, especially when needed most while removing many of the vulnerabilities of existing computer systems, notably their size, structuring and human interface.

The paper will be divided as such: the first section will deal with existing systems, hardware, and then software. Followed by this will be a brief synopsis of what the author views to be standard weaknesses within the market available hardware and its applications to the disabled community. After this section will be an explanation of how these hindrances have been overcome and lastly how the new product will offer the potential to revolutionize communication devices as well as computer systems geared towards individual living with variable disabilities. It should be noted that the authors experience tends to be more familiarized with physical disabilities and quadriplegia in particular.

With fear of oversimplifying and generalizing the following discourse, a few general arguments will be made in regard to individual personal computers. Primarily they tend to be off the shelf, mass produced Microsoft Windows or Apple operating system based computational systems. There are some modified variants to the existing human interface devices such as large key keyboards, ball mice and track pads, joy sticks, and key guards. Each device tends to be a separate unite that must be purchased in addition to the off the shelf computer, with the exception of track pads which are standard in laptops. Consequently, the standard mouse and QWERTY keyboard as it may be standard is sub-standard for many individuals with disabilities ranging from dyslexia to fine motor-impairments.

Some high ends systems such as the Mayer-Johnson VMAX and EyeMAX systems, as well as the MyTobii systems have done much to reconcile the human interface issue by focusing on eye

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gaze technology to guide the cursor. These systems are revolutionary in their own capacities for advancing hardware and software to such an extreme. As a result many individual with paralysis of the body are able to interact with computers to facilitate variable operations, yet these devices have their own weaknesses, notably; size, weight, location, battery life, computational power, limited production demand, cost of development and sales cost to the consumer. The primary issues tend to stem from these systems initial development in the early part of the decade and as such have not kept pace with computer development for the most part. The second part of the list of issues, deal with the economic barriers that are inherent to these forms of systems in that they are intended for small populations. As such these system fail to be justifiable purchases for many individual that would only use them sporadically as they have enough capacities to make use without them, or that they do not have the adequate feel for many individual that have never used computers before and are not use to the regime of dealing with a cybernetic contraption.

As of yet we have not discussed the issue of switched which play a vital role in many disabled individuals communication strategies. Switched rely on a software interface to allow the computer to be manipulated with either a single or two click options, replacing all of the options for a keyboard and a mouse with software that presents variable menus and options to operate the computer with essentially one or two associated click buttons. The draw back to these systems tends to be their time requirements to achieve a given task as well as their rigid nature. The switch is a good option for many as attested to by Dr. Stephan Hawkins, yet is limited in its capacities.

On the software side of the issue, software is capable of undertaking practically any task that can be theorized. Through software bundles, non-verbal individual can speak, text can be manipulated and transformed into icons and pictographs for easier communication, as can be attested by the expanse of the internet and the applications of software seem to be quite limitless with imagination and perseverance. Thus many hardware systems such as the MyTobii and the V/Eyemax systems integrate custom software packages into their hardware to make their interfaces more personable and simple to use. The systems amongst the variety of other applications available from free download sites and pay sites infinitely expand the potential to augment communications and adaption of computer systems to individual needs. As such the primary advantage of software is that successive generations of software have the capacity to be bundled efficiently with other software to multiply the potential of a single device. Example, by merging an onscreen keyboard with a voice simulator, one has a programmable speech generating device.

The issue of hardware weaknesses is unapparent to most individual that do not spend time with individual with disabilities. Due to these individuals unique life structuring, the issues they face are fundamentally different that say to that of an able bodies university student with their full faculties. A university student may carry a computer to school in a backpack or a satchel, remove the computer, open it, plug the charger into the wall then when returning to their departure point; they will reverse the operations and proceed on their way. An individual with an advanced cognitive disability or with a severe physical disability may not be able to plug in the laptop to the charger without assistance, limiting the use and potential of such devices. This is only the

most apparent situation, yet a more complex and hypothetical situation will be presented. Johnnie is a young male desiring to attend university. He is very active in the community as he possesses his full cognitive faculties. Johnnie is in a wheelchair and does not have the use of his hands or feet. As such he has been granted a laptop, funded by the government and or by the university or another institution or family member. Thus Johnnie can use his laptop but due to the inability to plug it in, only when an attendant is around or he has aid of a fellow individual to perform certain operations such as opening the lid etc. furthermore due to the standard size of laptops, ranging from 11" to 17" monitors, the devices are quite large, and tend to be mounted to the wheelchair at face level on a tubular steel bar that is often designed to swing in and out. These arms mean the computer should be put away prior to movement and re-setup after movement limiting functional use time. Also the limited range of integrated wireless cards often prevents functioning internet capacities while in private or public transit. These are just some of the over simplified issue shat develop with using market available laptops for individual with complex disabilities.

As such, a new system is being proposed which takes into account the multiple advancements in hardware capabilities, as well as software and ergonomics. The system developed by Matthew Osterloo or York University in Toronto, Canada, had restructured the way computers and wheelchair prone individual interact. The primary display of the system is not the standard laptop monitor; rather it is an external monitor. The standard operation size at present is a 7" monitor. The monitor due to its slim size and low weight and durable construction can permanently be mounted in front of the user with no need to move it with the exception of when the user is transferring into or out of their chair. The display is small enough that the majority of users will be able to see it clearly from about 12"-18" away yet be small enough to permit a field of vision when moving or engaging in face to face communication with someone else. The monitor can clip in and out and due to the light size can use a flexible arm to mount in practically any position even on standing and reclining wheelchairs. The monitor will have a built in rechargeable battery as well as a wireless VGA adapter permitting the entire monitor to be 1) rechargeable, 2) wireless in all capacities 3) to function with a second monitor so that even if one is charging, a second one can be swapped onto the arm to prevent down time. Attached to the monitor is a rotating IP camera that permits face to face communication from afar as well as a tracking feature for guardians of individual that may be lost or have cognitive impairments. The laptop and its components are not positioned with the screen in front of the user, rather they are embedded within a durable case that is mounted to the back of the chairs backrest in a slim line manner. The device uses a neoprene envelop with Velcro to wrap around the back of the seat behind the cushion without causing discomfort. The computer mounts to the back of the seat outside the interference of the user. Furthermore due to the slim profile, the device is kept out of the way of bags, and essential equipment that may be hanging on the back of the chair. The system is designed to have as few wires as possible, primarily one for the monitor and one for the power charger, yet in the second generation the monitor will be wireless with a battery pack eliminating all wires about the chair, and the charging unit has a retractable wire design permitting safe and convenient storage of the wire when not plugged in (diagram1).

Within the slim line system behind the seat, the system is structures as so; the is a state of the art

7”-10.1” laptop with additional batteries, two fans; one input and one output, a USB adaptor, auxiliary battery power for the external display, possibly a CD-ROM if required and outputs for all applicable devices (VGA, USB,…). Furthermore the is a retractable power cord so that it can not be lost and all adaptors for the associated devices are built in. the most important feature perhaps is a modified USB wheelchair drive mechanism that permits the user to steer the wheelchair from the laptop desktop very simply and as efficiently if not more so than with a switch based wheelchair navigational device. Lastly, the device is recommended to be attached to a Rogers* Rocket-stick wireless transmitter permitting wireless communication anywhere a cellular signal can be received (ie, in transit). Bundled to the system is the IP camera.

Integral to the system is an additional battery and wiring system which permits a) up to 24hrs of battery time with a low weight component (a few pounds [3-4]) as well as all the required adaptors and wiring to make the system completely portable and self sustaining for an extended period of time, as the customer base often does not have ability to charge their system repeatedly everyday between applications, especially if the system is designed to be permanently operational. As such, where as the Vmax system may have a 6hr or 8hr charge, and the MyTobii may have a 12hr charge, for the same weight as either system; this proposed system has the potential to permit up to 24+ hr operations when using basic applications.

The system proposed is present developed with the exception that the designer is utilising a Asus eeepc 701 with a single battery capable of 4.5hrs of battery life, yet with the new development of small notebooks with low watt power consumption and reduced setting for power consumption, the present generation of notebooks can support up to 12hrs of batter life per charge. In this case, two or three batteries are linked in a circuit together in a parallel circuit to extend the battery life of the device. Unfortunately a second different battery may be required to operate the fan/cooling system as well as to power the external monitor, yet it is fully feasible to link all the operations into a single battery source that will be charged from one outlet in a very short period of time. As such, due to the heat developed from charging the unit, the batteries, transforming power through an adaptor and the notebook itself, an input and output fan are absolute requirement for the system to prevent overheating, and damage to the system.

These are not all the specifications of the systems, yet they are the fundamental aspects of the physical system developed by Matthew Osterloo of York University, Toronto over the summer of 2010. The system is unique for a number of reasons, primarily because it uses so little custom hardware. The devices user from the IP camera and notebook to the batteries and wheelchair navigation system are all individual components available through retail. The unique aspect of the project is the way in which it has been bundled together. It permits anytime web access and voice synthesizing capabilities with the ability to navigate a wheelchair while undertaking any number of other tasks. Furthermore the cost of the device is miniscule compared to other devices. The device with external monitors and all other components should retail for under $1’000 Canadian, when purchased individually. When these components are ordered in bulk, their price diminishes considerably and if the system was to be restructuring to only use the computer mother board, and generic items, it is feasible the system could be manufactured for $500 or less per unit. It is completely feasible within 5 years to produce the system for perhaps

even as little $100 or $200 due to the depreciation of technology and the advancing speed of computer devices.

This system retains the existing notebook as one solid component for various reasons, primarily diagnostics. The ability for a technician to open the slim line case and interact with the computer in a standard fashion or to swap it out entirely in a number of minutes is a considerably advantage. It is even possible to position a solid-state memory ship within the system to act as a permanent backup which would prevent the loss of personal and sensitive files as well as reducing the time required to switch and upgrade systems.

Ideally mounted to the exterior of the system will be an LCD or LED screen that will be programmable by the user. Why? For personality. It would permit the user to be more individual in their own regards, and modifies the device from being simply a computer to being an expressive part of them. In many respects it can act as a designer t-shirt or as a nametag.

The system is to have a custom Graphic User Interface (GUI) to operate within a Microsoft Windows 7 Operating system. The windows 7 operating system is by far the most advanced operating system on the market and is very intuitive. The narrator option, the built in text to speech as well as voice recognition software along side an onscreen keyboard with variable size and click options is impeccable and a testament to Microsoft's accessibility features and their foresight. As a result, windows 7, due to its included accessibility features, low cost, various human interface structures and its present standard as a market primary OS will be the default operating system. Furthermore the system is completely capable of being remote operated into using default software from Microsoft as well as third part software permits the system to be troublshoot (with the Rogers Rocket-stick*) from anywhere any time from a central administrative positions, removing the requirement for technicians to be sent out on calls and reducing the overall cost of the overarching systems and personnel. It is commonly known within the the tech industry, a large portion of any technology cost is derived from the human factor of requiring upkeep and technicians. This system fro the most part permits complete independence of the user from a technologist or personal aid, and can permit almost all upgrading and tech work to be done from abroad. Also if there are fundamental problems with the system, personal data can be automatically downloaded and swapped into a new device to be sent out to the customer in short order.

A custom GUI will permit users to send free text messages via internet websites to anyone on earth to communicate with guardians or friends. Skype in conjunction with the IP camera permit live chat options and the windows 7 voice control system can permit all aspects of the system to be voice activated. Most interesting perhaps is that the system is almost completely customizable in design, color, shape and appearance. The addition of the AT&T and Cepstral voice as utilising the SAPI 5 file structure supported by Microsoft's Windows permits the voice synthesizing aspect of the system to more closely reflect the actual personality, culture and background of the user.

In addition, a host of free software application or meagrely prices applications can be bundled together within the system permitting a huge range of versatility for the system. Head tracking

software, pupil tracking software, audio news programs and a pictographic software permits the system to be adapted to almost any individual. These application as well as custom voices and other software may initially increase the cost of the device, especially if a screen reading program just as Freedom Scientific's JAWS is loaded, yet bundle purchases of most software is most likely a valid option and will reduce costs substantially.

Prepared by: Matthew William Osterloo
Sunday, September 26, 2010

Why is it important to have cheap and affordable computer for individual with disabilities? In Ontario, Canada, individuals with disabilities have various mechanisms by which to get a laptop as a learning air or a communication aid. The Ontario government operates the Assistive Devices Program (ADP) as well as the Centralized Equipment Pool Program (CEPP) and various other programs with specific mandates. York University has a program which supplies computers as learning aids to individual with a diagnosed disability and many elementary and high schools are not distributing laptops to aid student in their academic careers. It has become an intrinsic part of Canadian and western society to be connected electronically to our community which is often replacing many aspects of face to face communication and is progressively redefining social contact*.
As computers are an invaluable communication tool, their distribution to individuals with communications impairments is a non-questionable right. It is as intrinsic as the right of free speech and the right of open and free communication. Unfortunately in many parts of the world, these are not intrinsic rights due to economic variables beyond the control of those living in poverty. It is unfortunate enough that many children and mothers are not receiving the bare nutritional rations required for sustaining a healthy lifestyle, yet many of these issues are too large to be tackled individually, and as such many amazing individuals from NGO's and other government and private initiatives combat these issues globally on a daily basis.
Communication though is one aspect in which we can make a conscious and visible change. With the reduction in the cost of personal computers, and the development of more powerful components and software bundles, a new doorway has been opened to the millions of individuals living* with complex communication and physical disabilities globally. As almost one third of the world population lives on less than $1 a day, the affordability of a Eye Gaze system costing $10,000 or $20,000 is unattainable to entire sections of the worlds populations. Where these communication devices fail to targets this specific group, there lies unparallel potential as a captive

customer base. If a cheap system can be produced for $100 or $200 per unit with a viable software bundle, any individual with connection to power lines has the potential to be a customer of a system. The key is that the prior systems released are unattainable to too many individuals and as such, the system consciously are not disseminated due to profit margins; a constantly expanding customer base is already existing.

In Asia Minor for example, China and India combined possess over one third of the world's entire population. In excess of 2.4 billion individual live within the two countries. Countless citizens within the two states live in poverty, but within each state, there is a quickly expanding middle class capable of affording a modifiable communication aid that retails for a few hundred dollars. As both of these states expand, their internal power grids are becoming more westernized and capable of sustaining larger loads and more electronic equipment. We have recently seen this trend emerge as Research In Motion (RIM) has escalated to being the number one smart phone manufacturer in the world, distributing millions of phones within these two countries, and each phone costs considerably more than the proposed unit. Thus as evident by RIM's success, there is an affluent middle and upper class within these states (as well as most others) that are capable of purchasing technology, and furthermore there is a sophisticated internal power grid capable of feeding the electricity efficiently to users.

Thus we are left wondering why? Why is a variable question: why have other companies not expanded? Why is it important to expand? Why would you want to be part of the expansion? The answer lies in some very simple answers. To the first why, the profit margins tend not to be high enough in developing countries to invest expensive equipment when the state is not the primary purchaser. If a state has a large destitute population they often can not afford expensive equipment and as such will be neglected by corporations. Furthermore, often reliable supply chains are lacking preventing tech support, dissemination, repair, financial collections etc. Thus the failing of expensive technology become the primary mechanisms of a cheaply distributed product. If a product can be purchased for cash, no collections systems must be initiated. If a system is connected to the World Wide Web, ti can be troubleshot from anywhere globally. If a system is simple, durable and easy to repair, it can be replaced, discarded, recycled or refurbished. Best of all a cheap system is affordable to NGO's and charitable organizations to purchase at home in the West and to distribute as aid in the Far East and in third world countries to

those who need it most.

Charitable organizations that already undertake aid work as part of their mandate or though their charity often seek out new and inventive ways to help those in need. As such, expensive units just as medications are beyond the reach of these organizations, but if we are to examine the dissemination of generic drugs to third world countries, it becomes far easier for low cost medications to be bought in bulk and given to those whom need them most. Technology in many respects is premised upon the same fundamental strategies. Once the initial cost of development is invested in a product, the R&D costs are internalized and progressively the product depreciates in value. Anti-retroviral drugs that were once beyond the reach of those in South African states, are now supplied by NGO's and the UN (as well as states) and the poor are once again granted the ability to live freely. The same concept applies to cheap computer systems for individuals with disabilities.

By manufacturing and distributing a los cost, durable and multi-application system, an immense customer base develops. An individual doesn't have to have a poser wheel chair to use a system, they can be in bed or a cart of the mounting system is correct. Power is the only requirement. In time as the system is redeveloped, superfluous components are expunged, bulk purchases are initiated, and mass production occurs in low cost venues, the cost of the system drops infinitely. Even the cost of software is diminished when the proportion of customers and potential customers becomes a leverage point and new free and cheaper software becomes available. Best of all, due to the plethora of available software donated through the internet, one system can be configured to operate in dozens of different capacities and thus can be utilised by an extensive customer base. Lastly, due to the exceptional internal components of the computer systems, they can operate increasingly complex applications and as such will be able to run custom software applications with no augmentation required to the basic design model. One system can be applied from the hospital to the home, from the wheelchair to the backpack. Also once the unit is purchased, if the user gets better or succumbs to their mortality, the system is completely capable of being donated to another individual or of being given to someone else. It is not unfeasible to imagine organizations such as the Red Cross purchasing multiple machines with the expectations that they will eventually be given back and thus redistributed through their supply chain to those in need.

Back in Canada, not every province is lucky enough to have amazing programs such as ADP and CEPP. Other provinces such as Saskatchewan do not have comparable programs, thus there develops a community that is economically marginalized from affording the present equipment at market rates. As such, even in Canada there is a community of individual that is not aided by the social system when it comes to writing aids and computer aids. In the United State where there is not universal medical system, private insurance is beyond the reach of many individuals. A system as such proposed herein, is actually cheaper than a single months worth of medical coverage for many people. Even at present costs, the system is cheaper than midrange and high-end laptops and thus will surely compete effectively in the markets. Adam Smiths notion of the invisible hand of the market is the pivotal notion. As many individual can not afford the existing systems, a system must be manufactured that they can afford. Thus whichever system is released to the market that is affordable, customizable to permit multiple customer bases, and 'individualized' to express the individual nature of the user will be guarded by the invisible hand and not hindered by it.

It is a firm belief by many in the Canadian disability community that the community has not funds. That they cannot afford new equipment. That they are too costly and not revenue generating and thus, companies will not succeed if they target their products towards this community. This is a fallacy and is completely incorrect in the majority of respects. Yes, an individual on ODSP in Ontario can not afford to privately buy a $10'000 computer system, but why should a system be kept at an artificially high profit margin in order to increase stock prices? For one, this view takes the individual disabled communities as individual and refuses to view them as a world issue. If you have a disabled individual in India, and a similarly disabled individual on a first nations reserve in Ontario, they are not two different individual in two different economic spheres. They are two individual within the same capitalist market and what one individual does, has repercussions upon the other. If one individual buys a device, it depreciates the values of the overall manufacturing process and components, making it more affordable to the other individual. Secondly, in a global marketplace borders are porous and open to trade. To view individual with little capital in Ontario, Saskatchewan or India as three separate groups is false. The reality is that globally there is a stigma attached to individuals with disabilities. Many individual are rendered incapable of working due to their conditions. As such many individual as they are left without the capacity to work are left without the financial fruits of their

labour. This is a global condition and one which must be tackled if it is to be overcome.

Many of the medical devices being brought to market are extremely expensive to develop by nature such as Pharmaceutical drugs with extensive R&D periods. Though once generic versions are permitted, the associated costs are reduced extensively. Thus a product that can compete in a low cost marketplace stands a chance. to believe that no one with a disability has finances is incorrect, they just do not have the same finances as the majority of citizens. If this can be mitigated, the combined asset value and market potential if the group can be harnessed and exploited to become a massive customer base regardless continental affiliation. Altruistic perhaps, but we should not obfuscate the economic potential of this customer base with simple and biased rhetoric's predicated upon existing stereotypes. The capacity to make even a section of such a community computer literate will necessarily permit these individual to undertake employment within certain computer industries, as well it will necessarily develop new companies and make many individual more employable than they are at present.

To recapitulate, there is massive untapped potential within the economic sphere for the development of devices geared towards individuals with various disabilities. To be competitive within the market, a device has to be cost efficient as well as multi-purposed. A system that only targets one customer base is incapable of competing in a global market place; their position is in a niche industry domestically. Furthermore, any competition within this industry is beneficial as it opens up the market to more players and integrates more customers expanding long-term potential for all market entities and recipients. A few years ago when the initiative was commenced to produce laptops for $100 and desktops for $200 to be supplied globally to those living on meagre finances, many though it was unfeasible and impossible. At present, we are just about at the state where a generic notebook can be built and shipped for $100 and the only this that is missing is a sizeable profit. This paper posit that a similar movement should be initiated that proposes cheap and affordable computers for individual with disabilities. It is an area of the market that has growth potential and had a dedicated customer base.

By: Matthew William Osterloo B.A. Hon.
Sunday, September 26, 2010
York University, Toronto, Ontario, Canada

Diagram index:

1. Latex membrane/ covering
2. Touchpad chip
3. 12 pin connector mounted on chip w/ locking mechanism
4. Flat flexible cable (ffc)
5. FFC adapter end
6. Soldered ends of FFC
7. FFC plastic sheath
8. Lead 5+
9. Lead clock
10. Lead Data
11. Lead ground
12. Lead left click
13. Leaf right click
14. Ps/2 adapter
15. Ps/2 cable
16. Ps/2 over sheath
17. Ps/2 individual wired sheaths
18. Ps/2 5+
19. Ps/ clock
20. Ps/2 data
21. Ps/2 ground
22. Small gage wire
23. Nipple
24. Top button plastic film with etching
25. Middle button plastic film with hole
26. Bottom button plastic with etching
27. Glue
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29. Solder
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Tools:

1. Soldering iron,
2. cutters,
3. file

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~~List of diagrams and pictures:~~

I claim:

It is the first of its kind to:

1. The device being patented is an oral touchpad
2. The device is intended for medical applications as well as gaming, entertainment, recreational and military uses.
3. The device has a button/switch mounted into the casing or onto the touchpad.
4. The device can be connected with PS/2, USB, USB mini, Bluetooth, other Radio
5. Frequency or IR amongst other means of connecting between computer consoles and the device.
6. Set item is water-resistant and enjoys a water tight casing.
7. The water tight casing can be made of plastics, rubbers, metals, or any other form of watertight barrier that is non-toxic to human.
8. The devise is intended to sit between the teeth and the cheek tissue while in use.
9. The device is lined up vertically to stand parallel to the teeth.
10. The device with proper modification could sit on the roof of the human mouth to permit contact with the tongue.
11. The device is small enough to enter into the mouth comfortably.
12. be small enough to be positioned in the human mouth, 2) be designed to interact with the tongue,
13. is intended to be used in the side of the mouth and not before, outside, in front or attached to the pallet.
14. it is the first touchpad to be wired and waterproofed to be used as a standalone prosthetic and watertight oral prosthetic.
15. the first touchpad designed to be a primary tool of interaction for individuals with no bodily movement.
16. First device intended to be a tongue operated primary interface for a computer with an accessible left and right click option.
17. First device intended to give full computer use to quadriplegics without eye gaze technology or single actuator switches.
18. First to be sequestered between cheek and jaw to remain stationary and prevent moving or swallowing
19. Oral touchpad, cheek positioned mount.
20. Water resistant casing.
21. Wiring, manufacturing style and process.

22. in a touchpad device, the combination of a water resistant casing, comprising a comfortable casing; as well as internal wiring configuration, corded or wireless connection to a computer and modified chip structures are required in developing a functional device.
23. This oral touchpad device is the first device to be situated in the cheek cavity of the oral cavity.
24. first touchpad to be enveloped in a water resistant casing
25. first oral device intended to be an independent stand-alone unit intended to act as a human interface device for individual with severe disabilities
26. a device capable of being connected to a suction hose and able to automatically suction fluids from patients oral cavities.
27. wireless capacity
28. tongue activated human interface device
29. versatile shaper permitting location placement on in left cheek or right cheek
30. integrates a left click options and a right click option to facilitate easier
31. the touchpad chip of claim 1 comprises rounded and curved corners to improve comfort.
32. comprises a battery for wireless systems
33. comprises an exposed area of touchpad to limit the touch sensitive area surface fo the touchchip
34. the exposed chip circuitry is covered in a water resistant material to retain a dry environment.
35. designed to work with software for individual with disabilities or scuba diving...xxx
36. can be merged into oral prosthetics such as partials and full replacement component to affix the device to a specific area of the mouth on a specific side.
37. first of its kind to drive a wheelchair. This product competes with a) touchpads that are mounted before the mouth to be activated by the tongue, lips or chin exterior to the oral cavity. Differs from joysticks in the also the joystick is external to the human body and is a completely different configuration fo components.
38. The device has been intentionally designed to permit individual lacking the muscle capacity to extend the tongue outside the mouth to retain control over the device.
39. The system is connected through to the computer which transmits information via USB to the drive mechanism. This mechanism is configurable in various diferents configurations. Celenoid, servo or direct current to the drive mechanism to enable directionality and propultion.
40. This is the only deivce that will permit permit ALS patients to control all the features of a wheelchairs navigations and positioning systems from within the oral cavity using the inter-oral touchpad and the assocated configured computer system.
41. First of its kind to permit quadriplegics to use a computer with their mouth.
First of its kind to permit a watertight computer mechanism to be Orly
inserted and removed to permit computer access.

First of its kind to enable Bluetooth wireless transmission to and
from the computer to reduce war propensity
first of its kind to include a battery to permit wireless transmission
first of its kind to permit left and right click options for an oral
touchpad device.
First of its kind intended to work with voice generating software and
text messaging software in order to allow participants and users to

communicate via artificial voice synthesizers [speech generating devices]
first of its kind to be made of medical grade components so that long-term exposure Worley to such a device would not threaten the physical health of the consumer
first of a kind to use PS two were USB ports in the transference .

First of its kind to be wired into a wheelchair drive mechanism in order to permit wheelchair navigation
first of its kind to be built-in to the end of the oh will care system which permits mobility of the device and long-term operations.
First of its kind to be wired up through PS two and a 12 pin flat flexible cable to permit a non-hardwired option to touch pads.
First of its kind to use ultra small touch pads as an internal alternative. And this is in departure from patent XXX as described in earlier section in a patent application and as this device is a standalone unit and not a multifunctional apparatus. Secondly due to the location of the device it is considerably different because it is not mounted to the soft palate at the top of the mouth.

42. The device is the first to permit full access to a conventional mousse functions from within the mouth.
43. Q. how do I mention the system that is being designed for this structure?
44. Do I submit both application or one single application / separately or together?
45. The pad is water tight, custom, durable, wireless, wired, compatable, size, application, ruggedized and medicinized to have primarily medical grade components.
46. Anti-choking mechanism? Locking system same as partials.
47. Same plastic as partials.
48. Built in Bluetooth transmitter n receiver, rf transmitter, ir transmitter,
49. Capacity to be a stand alone direction n navigation component.
50. Capacity to tie in to coclear implants.
51. Sgd with independent hand held device (blackberry styled)
52. Abilityb to tie into Bluetooth shades
53. Built in speaker
54. Built in suction
55. connection to a cochlear implant

57. The inter-oral mouthpiece is connected via usb to a miniture laptop known as a netbook. The specific make is not important, what is more pressing is technical specifications. It must be a fully windows or linux capable system capable of executing voice simulation programs and tracking programs. It is also capable of operating web cameras and facial tracking software as a default software protocol incase the inter-oral hardware is not located in teh mouth. A recognized program is "camera mouse".

58. The laptop is connected through usb to a bluetooth emiter as well as a wireless vga adapter. The wireless vga adapter permits the lcd monitor to recieve a transmission without the hassel of wires. Built into the lcd laptop is a series of rechargeable batteries and a charging mechanism.

59. Via another USB port, a circuit board and software program will drive a (usb missile launcher) wheel chair steering mechanism.

60. A usb suction device may be possible (medical) – ?too much?

Led name tag :) customization

61 spandex, stretch nylen or neopreme soft:case. also possible with nylone synch cords and plastic clips if neopreme isnt wise. Washing etc.

62 moulded plastic hard case from GW makers (or style) light and durable.

63 Retractable powercord

64. plug in charger for monitor in hardcase. Safe swing door? Mount required

65 Gooseneck mount for LCD Monitor

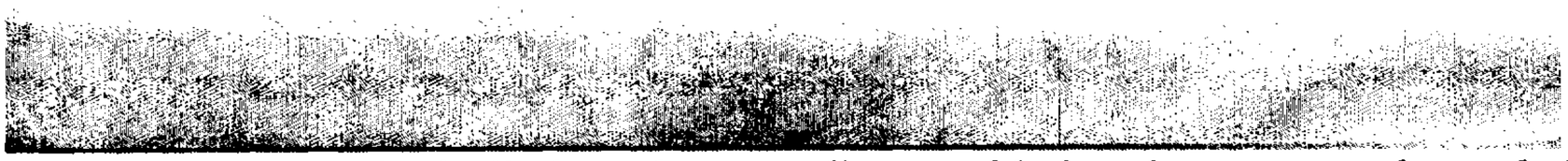
66. arm must be mentioned as it is pivitol to the system. Custom designed arm? ????

power chargin aparatus?

67 SYSTEM DOES NOT USE BUILD IN LAPTOP display as it relies primarily on external system. The system can be plauged in incase within aelectronic inteference sensitive area such as hospitals. Slinky cord connects to monitor to connect power and alos vga.

Water resistent plastic case

- Explain MSL Launcher



68. a USB operated missile launcher was disassembled to demonstrate the probability of using low end navigation systems to move servo motors attached to wheels. The USB missile launcher was capable of operating three individual servo motors to steer left, rught and to move forward/ backwards.

69. video game capable and with a built in video-game mode.

Application number / numéro de demande: 2718303

Figures:

Pages: 1 to 14

Unscannable items
received with this application
(Request original documents in File Prep. Section on the 10th floor)

Documents reçu avec cette demande ne pouvant être balayés
(Commander les documents originaux dans la section de préparation des dossiers au 10ème étage)

8033