An electronic moving target system and method, which users may aim and shoot various instruments at which can be configured to present rigid or flexible targets from a variety of different directions. The target system presents users with realistic moving targets which may be quickly and easily be replaced as needed. The moving target system is fully programmable by a user and may present a series of varying challenges to a marksman. The moving target system may include a target surface operatively connected to a control arm which is powered by a motor. The motor receives signals from a control box supplying instructions from a microcontroller.
Fig. 3A
Fig. 3B
Fig. 7A

Fig. 7B
REPLACEABLE MOVING TARGET SYSTEM AND METHOD

FIELD OF TECHNOLOGY

[0001] The following relates to a user controlled target system and method, and more specifically to embodiments of a moveable target providing integration of easy to replace, inexpensive target surfaces into a fully programmable, portable, motorized target practice system.

BACKGROUND

[0002] Conventional shooting targets such as paper or metal targets are typically either stationary or use centrifugal force to create motion for a short duration. Stationary targets do not accurately simulate real life scenarios in which targets are typically in motion. Additionally a stationary target is less challenging to hit.

[0003] Devices which rely on centrifugal force to generate motion require the user to manually set the target in motion and the movement will typically last for a limited period of time. Targets that require the user to manually set the target in motion may not safely be implemented in facilities where multiple people are shooting because it could potentially place the user in the line of fire from other shooters.

[0004] Devices which rely on metal targets present a further safety risk as projectiles can ricochet off of the target object and back towards the user or toward other individuals in the vicinity. The ricochets may be dangerous due to their unpredictability and ultimately cause injuries or may damage expensive equipment. Furthermore, the replacement of metal targets may be time consuming and involve an intricate installation or disassembly process. Metal target systems can require invasive changes to the range’s infrastructure at great expense and may require extensive periods of time when individuals must refrain from actively shooting down range.

[0005] Thus, a need exists for a fully programmable moveable target which also features quick installation and removal of used target surfaces, a method for moving a target in various user controlled directions from a safe distance and a method for quickly installing and removing the replaceable target systems.

SUMMARY

[0006] A first aspect of this disclosure relates generally to a moveable programmable target practice system comprising a target surface, a control arm capable of receiving and securing the target surface, a motor capable of changing the target surface’s position; and a microcontroller capable of directing the motor’s output.

[0007] A second aspect of this disclosure relates generally to a method for moving a target comprising the steps of placing the microcontroller in communication with a motor, programming a microcontroller with at least one set of instructions to control the motor, connecting a control arm to the motor, attaching a target surface to the control arm and supplying a signal to the microcontroller to execute at least one of the at least one set of instructions.

[0008] A third aspect of this disclosure relates generally to an apparatus for securing a target surface comprising a least one pair of intersecting grooves, wherein the at least one pair of intersecting grooves include at least one flange interlocking with the target surface.

[0009] A fourth aspect of this disclosure relates generally to a method for securing a target surface to a control arm comprising interlocking a first side of a target surface with a first side of a control arm and interlocking a second side of the target surface against a second side of the control arm.

[0010] A fifth aspect of this disclosure relates generally to an apparatus for target practice comprising a removable target surface, a control arm and a means for securing the target surface to the control arm.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] Some of the embodiments will be described in detail, with reference to the following figures, wherein like designations denote like members, wherein:

[0012] FIG. 1 depicts a perspective view of an embodiment of a moving target system;

[0013] FIG. 2A depicts a front view of an embodiment of a moving target system;

[0014] FIG. 2B depicts a side view of the embodiment of the moving target system of FIG. 2A;

[0015] FIG. 3A depicts a flow chart of an embodiment of a moving target system;

[0016] FIG. 3B depicts a flow chart of an alternate embodiment of a moving target system;

[0017] FIG. 4A depicts a front view of an embodiment of a control arm;

[0018] FIG. 4B depicts a side view of the embodiment of the control arm of FIG. 4A;

[0019] FIG. 4C depicts a top view of the embodiment of the control arm of FIG. 4A;

[0020] FIG. 5A depicts a perspective view of an embodiment of a motor box;

[0021] FIG. 5B depicts a side view of the embodiment of the motor box of FIG. 5A;

[0022] FIG. 5C depicts a front view of the embodiment of the motor box of FIG. 5A;

[0023] FIG. 6A depicts an exploded view of an embodiment of a control arm and a motor box;

[0024] FIG. 6B depicts a perspective view of an embodiment of a control arm attached to a motor box;

[0025] FIG. 7A depicts a front view of an embodiment of an input mechanism;

[0026] FIG. 7B depicts a side view of the embodiment of the input mechanism of FIG. 7A;

[0027] FIG. 8A depicts a front view of an alternative embodiment of the moving target system featuring an array of targets;

[0028] FIG. 8B depicts a side view of the alternative embodiment of a moving target system of FIG. 8A;

[0029] FIG. 9 depicts a flow chart of an embodiment of a moving target system featuring a computer as a wireless input mechanism.

[0031] FIG. 10A depicts a side view of an embodiment of a moving target system while installing a target surface.

[0032] FIG. 10B depicts an exploded view of an embodiment of a target attaching to a control arm.

[0033] FIG. 11A depicts a front view an alternative embodiment of a moving target system including a swivel.

[0034] FIG. 11B depicts a front view of the alternative embodiment of FIG. 11A including a secondary motor attached to the swivel.
FIG. 11C depicts a side view of the alternative embodiment of FIG. 11A including a secondary motor attached to the swivel.

FIG. 12A depicts a side view of the alternative embodiment of FIG. 11A including a control arm attached to the secondary motor attached to the swivel.

FIG. 12B depicts a front view of the alternative embodiment of FIG. 11A including a control arm attached to the secondary motor attached to the swivel.

DETAILED DESCRIPTION

A detailed description of the hereinbefore described embodiments of the disclosed apparatus and method are presented herein by way of exemplification and not limitation with reference to the Figures. Although certain embodiments are shown and described in detail, it should be understood that various changes and modifications may be made without departing from the scope of the appended claims. The scope of the present disclosure will in no way be limited to the number of constituting components, the materials thereof, the shapes thereof, the relative arrangement thereof, etc., and are disclosed simply as an example of embodiments of the present disclosure. The figures, in some cases, show overlapping components in assembly. The overlap is illustrative of an interference fit in which the components flex or otherwise accommodate the assembly of the components.

As a preface to the detailed description, it should be noted that, as used in this specification and the appended claims, the singular forms "a," "an" and "the" include plural references, unless the context clearly dictates otherwise.

Referring to FIG. 1, which depicts a preferred embodiment of a moving target system 100. The moving target system 100 includes a motor box or housing 101. The motor box 101 may house and protect electrical components which may send electrical signals to the motor. The motor box 101 may be constructed out of any material sufficiently strong enough to protect the interior components of the motor box 101 including bullet proof materials such as Kevlar®, Lexan®, carbon fiber composite materials or sufficiently strong metals such as steel, iron, and titanium. The motor box 101 may store a power supply 301, a drive circuit, power circuit and a target arm controller 303. In one embodiment the power supply 301 may be an alkaline or lithium battery or other portable power system. In other embodiments the power system may be an AC or DC power supply, AC/DC adapter, linear power supply, a wall outlet, lithium ion or other battery types (both non-chargeable and rechargeable), switched-mode power supply, programmable power supply or even an alternative power source such as a solar panel or fuel cell. The power system is not limited to a single source but may include multiple power systems working together (i.e. wall outlet and a battery) or in the alternative, the power sources may augment each other, such as in the event of power loss from one power system 301, a battery backup may be initiated to replace a constant supply of power such as power flowing from a wall outlet.

As depicted in FIG. 3A the power system 301 may supply energy to the microcontroller 302 and motor 304. The power circuit uses the power supplied from the power supply 301 to initiate the drive circuit. In one embodiment, a microcontroller 302 may be located within the power circuit. In the preferred embodiment, the microcontroller 302 resides on a second power circuit and draws power from the power supply 301 separately from the power circuit. The second power circuit may smooth out the flow of power from the power supply 301 and evenly distribute it to the microcontroller 302 and the motor 304.

The microcontroller 302 may be a small computer on a single integrated circuit. The microcontroller 302 may contain any or all of the following components, including but not limited to, a processor core, memory and programmable input and output peripherals. The components of a microcontroller may be integrated on a Printed Circuit Board (PCB). The microcontroller may be a mixed signal microcontroller capable of integrating analog components needed to control non-digital electronic systems. In one embodiment, the drive circuit may be dynamically manipulated by a microcontroller 302. The microcontroller may achieve such manipulation by being fully programmable with instructions in any known programming language. Programming languages used to deliver instructions may include C, C++, PHP, Java, JavaScript, AJAX, Perl, Ruby, Python, Visual Basic, VB.net or any other known programming language. In the preferred embodiment, the microcontroller may be an Arduino programmed in the Arduino language based on C and/or C++. In yet another alternative embodiment, depicted in FIG. 9, the microcontroller 302 may be replaced with one or more computers 901, cellular phones, tablets or a combination thereof, capable of running programmable software and operatively capable of sending a signal to the motor box 101 to manipulate the power system 301, the power circuit and/or drive circuit.

The motor box 101 may be constructed out of a material rigid enough to protect the contents of the interior of the motor box 101 from incoming projectiles. Suitable materials for constructing the motor box 101 may include metal such as steel, iron, and titanium, wood, plastic, concrete, or bullet proof materials may be used such as Kevlar®, Lexan®, or carbon fiber composite materials.

As depicted in FIG. 3 and FIG. 4, the motor box 101 may include an input mechanism 305. In one embodiment the input mechanism 305 may be a button or touchscreen 102 capable of sending a signal to initiate a power supply 301 or change the operating mode of the target system 100. In an alternative embodiment a dial 103 may be substituted for the button 102. In the preferred embodiment a dial 103 may be used in conjunction with the button 102 to control the signal sent to the power supply 301. For example, manipulating the dial may be one means for increasing the voltage supplied to the interior components of the motor box 101. The increased voltage from the power supply 301 may increase the frequency of signals sent by the microcontroller to the motor 304 and thus may ultimately increase the output signal to the motor 304. In this preferred embodiment, the button 102 may initiate the power system and the dial 103 may control operating mode variables including but not limited to motor speed, direction and timing.

In an alternative embodiment, the input mechanism 305 may include a wired or wireless receiver 901 receiving inputs from a wireless transmitter, controlled by an input device such as a remote control 700. A wireless signal may be sent from a remote control 700 to the wireless receiver 902. The remote control 700, input mechanism 305 or wireless transmitter 902 may be dispatched using an infrared frequency or a radio frequency (RF) such as Wi-Fi or Bluetooth and may be received by a wired or wireless receiver’s 901 equipped with a sensor. In another embodiment, the receiver may be directly connected to the input device through such
means as a wire, USB cable or network cable directly plugged into the receiver 901. The input device is not limited to handheld remote controls 700 but in alternative embodiments may also include one or more computers 901, tablets, cellular telephones, or other device capable of sending signals to a receiver 902. For example a smartphone may be equipped with an application or program (an "app") which may generate a signal sent to the receiver and may be used as a controller 700. In additional embodiments, the input mechanism 305 may include features that recognize and respond to RFID tags. The RFID tag may be attached to an individual such as the user, third party or the RFID tag may be attached to an object, such as a pre-selected weapon. In the preferred embodiment featuring the RFID control mechanism, when the RFID tagged individual or object comes within a specified distance from the input mechanism 305, the system 900 may initiate operation. In the alternative, the RFID tag may initiate upon preselected distance or orientation of the tag in proximity to the input mechanism 305. For example raising a firearm into a position wherein the firearm is ready to be discharged may initiate the power supply 301.

[0046] In the embodiments of target system 100, the control mechanism 305 may also initiate one or more of numerous operating modes. In the preferred embodiment, the microcontroller 302 may be pre-programmed with many different operating modes which may be selected by the user. Operating modes may each include custom settings. Customizable settings may include variables such as motor 304 speed, the timing for which a motor 304 will initiate the operating mode or cease functioning, the intervals at which a motor 304 will change its speed, direction or the length of the motor stroke, the angles the target will swing, the resting period between the height of the swing, the angle and speed of the target surface's 110 rotational or twisting motion or any combination of these parameters. In an alternative embodiment, the target system 100 may be adapted to include vertical (up and down) movement as well, such as along a Y-axis. A target system 100 may also include an in and out movement along an X-axis.

[0047] In the preferred embodiment, the microcontroller 302 may be pre-programmed with two operating modes. The first operating mode may include a constant sweeping motion back and forth of the control arm 111 at a user designated speed. The second operating mode may include random movement by the target, and may include randomized variation in speed and direction of movement.

[0048] In an alternative embodiment, the input mechanism 305 may initiate a sequence of operating modes. The sequence of operating modes may initiate one after another or may include a rest period in between each operating mode. The rest period may be a pre-programmed time limit or may be controlled by the active user and/or third party. In yet another alternative embodiment, the microcontroller 302 may select an operating mode at random upon initiation of the power supply 301 by the input mechanism 305. Any of the aforementioned embodiments may utilize lights, sounds or a combination thereof to signal the initiation, completion and/or change in operating mode. Embodiments of target system 100 may also utilize lights, sounds and combinations thereof during operating modes in a preset or random fashion to further disrupt concentration and enhance the training of the user.

[0049] A conductive means may be used to communicate a signal from the microcontroller 302 and the drive circuit to the motor 304. In the preferred embodiment the conductive means is a series of wires operatively connecting the drive circuit and the motor 304. The wires may include a power, ground and signal wire. In an alternative embodiment a single power wire may be used. The wire(s) may output signals from the microcontroller 302 to the motor 304. The wire(s) may be any length or gauge of thickness capable of transferring the electrical signals sent from the microcontroller 302, and drive circuit to the motor 304. In an alternative embodiment, the target system 100 may be completely wireless. Instead of using a single motor box 101, wired or wireless connections may be used between a control box which may house the microcontroller 302, power supply 301, drive circuits and power circuits, and a separate motor box 101.

[0050] The motor 304 may receive electrical signals produced by the microcontroller 302 and the motor 304 may translate those electrical signal provided transferred through conductive means such as a wire, into a mechanical output. In the preferred embodiment, the mechanical output is the rotation of the motor's 304 drive shaft. In the preferred embodiment, the motor 304 may be a DC motor. DC motors may include servo motors, shunt motors, separately excited motors, series motors, permanent magnet DC (PMDC) and compound motors. In alternative embodiments the motor 304 may be selected from a group consisting of stepper motors, brushless DC motors, hysteresis motors, reluctance motors, universal motors induction motors and/or synchronous motors.

[0051] The selection of a motor may depend on the movement desired by the control arm 111. For example, in one embodiment, a servo motor may be used wherein the desired movement of the control arm 111 is in a pendulum motion and/or twisting motion along a pivot point. In an alternative embodiment depicted in FIG. 11 and FIG. 12, a first motor box 101 may be placed in communication with a second motor box 1230, preferably by a conductive means such as wire 1260. The two motor boxes 101 and 1230 are preferably equipped with servo motors and may be used together to articulate movement is both a pendulum fashion and a motion toward or away from the user. In yet another alternative embodiment a stepper motor may be used if the target system 100 is desired to be moved laterally along a fixed path. The target system 100 is not limited to a single motor or motor type; alternative embodiments may use any combination of one or more motors to achieve the desired movement or movements of the target system 100.

[0052] FIGS. 5A, 5B and 5C depict the preferred embodiment of the motor box 101. In the preferred embodiment, the motor box 101 may contain a splined gear 121 operatively connected to the drive shaft of the motor 304. Upon the initiation of the drive shaft, the splined gear 121 may rotate accordingly. The splined gear 121 may contain externally facing teeth or ridges as depicted in FIG. 5A. In this embodiment the external teeth splined gear 121 may be mated with a splined hub 122 which may be attached to or integrated with the control arm 111, as depicted in FIG. 2B. In the preferred embodiment of this mated connection, the control arm 111 includes an integrated splined hub 121 which may protrude from the backside of control arm 111. In the preferred embodiment, the external splined gear 121 mates with an internal teeth of the splined hub 122 by placing the splined hub 122 over the external teeth of the splined gear 121. Once mated, the output force of the motor 304 may be transferred by the external teeth of the splined gear 121 to the internal teeth of the splined hub 122 thus providing motion to the
In the preferred embodiment the splined gear 121 may rotate the control arm 111 clockwise or counterclockwise in any varying degree motion, including 360° of rotation or more. In an alternative embodiment, the splined hub 122 may have external radial protrusions which mate with the internal radial protrusions of the splined gear 121. In alternative embodiments such as the one depicted in FIG. 11A, FIG. 11B, FIG. 11C, FIG. 12A and FIG. 12B, one or more interlocking splined gears 121, 1221 may be used in tandem or separately to rotate the control arm in a twisting motion, or toward and/or away from the user rather than an arcing pendulum motion. The twisting motion may change the angle of the target surface 110 in relation to the user. One possible way to achieve variations in target motion is by using a system of multiple motor boxes 101 and 1230 communicatively attached to one another via a conductive means such as a wire 1260. In the preferred embodiment, a first motor box 101 may be outfitted with a swivel apparatus 1250. The swivel apparatus 1250 may be constructed out of any solid or rigid material such as metal, plastic, rubber, metal, stiff paper, any other means capable of supporting a second motor box 1230 including bulletproof material such as Kevlar®, Lexan® and carbon fiber composites. The swivel 1250 may be attached to the splined gear 121 through a screw or opposing splined hub attached to the swivel 1250. The swivel may further include a mounting brackets 1240 for fastening the second motor box 1230. In the preferred embodiment, the second motor box 1230 is fastened to the swivel’s 1250 bracket 1240 using screws threaded through a bore 1241. The second motor box 1230 may include a second splined gear 1221 capable of receiving a control arm 111.

In an alternative embodiment, the motor box 101 may be vertically mounted by attaching mounting hardware to a mounting bracket fixed on the motor box 101 thus securely fastening the mounting bracket to a mounting surface. Mounting hardware may include nuts, bolts, washers, clips, staples, screws, nails or any other hardware commonly known to attach brackets to a surface. The target system 100 may be mounted to a mounting surface which may include a wall, ceiling, beam, lateral cable or any other surface which may support a suspended target system 100. The target system 100 may be mounted in any orientation and is not limited to being mounted in a vertical position. For example the target system 100 may be mounted to a mounting surface perpendicular to the Earth’s surface such as a pole or column.

The Flange 107 may include a U-shaped hook or it may be perpendicular to the first groove 402. The shape of the flange is not limited to these shapes and alternatively the flange may intersect with the first groove 402 at any angle of incidence desired to secure and fasten the target surface base 113. The flange 107 or the parallel flange 108 may employ any of these shapes. It is not necessary that opposing flanges include the same shape, but in fact opposing flanges may include a combination of shapes. The intersecting flange 109 and 112 may also employ the shapes described pertaining to the flange 107 and parallel flange 108. Accordingly these intersecting flanges may employ a combination of flange shapes which may be the same as or different from each other and the flange shape of the first groove 402.

Alternatively, other embodiments may incorporate other means to fasten the target surface 110. The means for attaching the target surface 110 to the control arm 111 may include hooks, nuts, bolts, washers, loop fasteners, pins, nails, staples, screws, adhesives, glues or any known method of fastening one material to another. These alternative embodiments may be used separately from or in conjunction with the intersecting grooves 402 and 403 and the previously described flanges 107, 108, 109 and 112.

A target surface 110 may interconnect with the control arm 111. The target surface 110 may be made out of any material capable of being rigid enough to maintain its shape. The target surface 110 may also be constructed out of material that is flexible, resilient, yet still may be capable of having its shape manipulated. Rigid and resilient materials may include
paper, cardboard, plastic, wood, foam, or any combination thereof or any other material capable of being rigid and/or resilient to deformation, including soft or malleable metals. In the preferred embodiment, the target surface 110 is constructed out of cardboard and may be 5 to 10 inches wide, however any length or width of the target surface 110 may be used.

[0061] The target surface 110 may also be customized for specific projectiles. In one embodiment customized target surfaces 110 may include a surface designed to withstand the impact of an arrow released from a bow, compound, hunting bow or crossbow. In another embodiment, a target surface 110 may be further customized for arrows and bolts by laminating the target surface and/or applying foam based material to the target surface.

[0062] Other embodiments may further include designing the target surface 110 with increased or decreased thickness or with a specific material capable of withstanding the increased force of a bullet fired from handguns, shotguns or rifles. In these alternative embodiments the target neck 114 may be comprised of metal while the target surface 110 may still be comprised of cardboard or other soft yet rigid materials. Not only might the type of fire arm used be taken into consideration when fabricating the target, the target surface 110 may further be customized for durability based on the caliber of bullet fired. The target surface 110 and target neck 114 may be thicker or more rigidly constructed as the caliber size of the bullet used increases.

[0063] In yet another alternative embodiment, the target surface 110 may be coated with a reflective material to reflect a laser beam. Reflective material may include reflective tape, reflective paint, reflective coatings or any other substance capable of imparting reflective properties to the target surface 110.

[0064] Target surface 110 designs are not limited to the square or rounded shapes of traditional targets. Embodiments of target surfaces 110 may be customized to represent any geometric shape, animals, humans or any other creature, real or imaginary, and any shape whether it is two-dimensional or three-dimensional.

[0065] As depicted in FIG. 10A and FIG. 10B, the method for interconnecting the target surface 110 with the control arm 111 may include using the shape of the control arm 111 to bias the target surface base 113 against the structural features of the control arm 111. In the preferred method of installation, a first side of the target surface base 113A may be fitted or pressed against the interior side of flange 107, preferably at about a 45 degree angle of incidence with the first groove 402. The shape of flange 107 may hold the first side of the target surface base 113A in place within the first groove 402. The second side of the target surface base 113B may be securely mated with parallel flange 108. Similar to the first side of the target surface base 113A, the second side of the target surface base 113B may be fitted against the interior portion of the parallel flange 108. The shape of the parallel flange 108 may hold the second side of the target surface base 113B in place within the first groove 402. In order to make the proper interconnection, the second side of the target surface base 113B may be deformed or manipulated into position between the parallel flange 108 and the first groove 402. Once properly in position between the parallel flange 108 and the first groove 402, the second side of the target base 113 may be reformed back into its original shape. Upon reformation of the second side of the target base, it is preferred that the target base 113 lies securely and flush within the first groove 402.

[0066] In an alternative method of installation, the installation of the target surface 110 into first groove 402 may be conducted in the reverse order of the preferred method. Depending on the method used for inserting the target surface base 113, a user conducting the installation and removal of the target may deform either the first side of the target surface base 113A or the second side of the target surface base 113B to facilitate easier installation or removal. In this alternative method of installation, the target base 113 is angled into the control arm by first mating the second side of the target base 113B against interior portion of the parallel flange 108. The first side of the target base 113A may be deformed as necessary to angle the rigid yet flexible material, against the interior portion of the flange 107. Once the first side of the target base is in position between the interior portion of the flange 107 and the first groove 402, the first side of the target base 113 may be reformed back into its original shape. Upon reformation of the first side of the target base, it is preferred that the target base 113 lies securely and flush within the first groove 402.

[0067] In the preferred embodiment, once the target base 113 has been securely fitted into the first groove 402, the target neck 114 may then naturally fall flush within the second groove 403. In this preferred embodiment, the target neck 114 may be sized to a width that fits between the first intersecting flange 109 and opposing intersecting flange 112 to provide extra stability while the target system initiates operation.

[0068] FIGS. 8A and 8B depict an alternative embodiment comprising a multiple target system 800. The multiple target system 800 may be comprised of multiple target surfaces 806 and 811 operating using an array of motor boxes 801 and 810. FIG. 33 depicts a flow chart for one embodiment of the multiple target system 800. In this preferred embodiment, the first motor box 801 may contain a microcontroller 302, a power supply 301 and a power circuit and/or drive circuit. The first motor box 801 may also be capable of receiving a signal from the input mechanism 305. The microcontroller 302 may control both motor A 306 housed in motor box 801 and motor B 307 housed in the second motor box 810. The output from the microcontroller 302 may be transferred from motor box 801 to motor box 810 through or wireless transmission. The preferred conductive means are wire 804. In an alternative embodiment, motor box 801 and 810 may include two separate and complete motor boxes acting in conjunction with each other.

[0069] In the preferred embodiment of the multiple target system 800, a microcontroller 302 may be programmed to independently control each motor 801 and 810 with separate sets of instructions, ultimately independently controlling the position of each control arm 807 and 813 independently. Accordingly, the parameters described above including speed, angle of the target surface, start and stop time, and stroke of the motor may be independent from each of the other motors 801 and 810 in the array of motors.

[0070] Target surfaces 806 and 811 may be identical to each other or the target surfaces 806 and 811 may differ in shape and size from one another. In the preferred embodiment the multiple target system 800 may be suspended from the ground however one or more of the control arms 807 and 813 may be mounted to a ground surface, or a mounting surface. The multiple target system 800 is not limited merely to two
target surfaces, but may include an indefinite number of targets in alternative embodiments. In these alternative embodiments the innumerable amount of targets may be controlled by either a single motor box or in an array of motor boxes as described above.

[0071] The multiple target system 800 may be controlled similarly to the method described above for the single target system 100. In the preferred embodiment of the multiple target system 800, a master remote control 700 capable of individually controlling each motor 801 and 810 may be used. The master remote control may be capable of issuing separate commands to each motor 801 and 810 or it may issue a single set of instructions to both motors 801 and 810. In an alternative embodiment, one or more individual remote controls may be used to input separate commands to each motor 801 and 810.

[0072] In the preferred embodiment, the method for moving a target system 100 may include constructing a motor box or housing 101. The step of constructing the motor box 101 may include fabricating the motor box 101 out of a material rigid enough to protect the contents of the interior of the motor box 101 from incoming projectiles. Suitable materials for constructing the motor box 101 may include metal such as steel, iron, and titanium, wood, plastic, concrete, or bult proof materials may be used such as Kevlar®, Lexan®, or carbon fiber composite materials.

[0073] The method for moving a target system 100 may further include assembling a series of electrical components which may send electrical signals to the motor 304 or in alternative embodiments a series of motors 306 and 307. The motor(s) 304 may each be housed within the motor box 101 or separately from the motor box 101. The step of assembling electrical components may include placing electrical components in communication with each other. Electrical components may include one or more power supply 301, input mechanism 305, microcontroller 302, target arm controllers 308 and 309, as well as placing electrical components in communication with mechanical devices such as motor 304.

[0074] Electrical components may be placed in communication with one another using various means. Wires of various lengths and gauges to accommodate desired voltage requirements may be used. Alternatively, electrical components may also be placed in communication with one another by using printed circuit boards (PCB) or printed wiring board (PWB) which may include electrically conductive pathways, tracks or signal traces and may be etched from copper sheets laminated onto a non-conductive substrate. In the alternative, electrical components may be soldered together in a manner that allows for the electrical signal from each component to be delivered to each other connected component. Communication is not limited to these forms but may also include other known means for distributing, storing, switching or converting electrical energy. Such alternative forms may also include or incorporate switches, relays, transformers, resistors, and semiconductors. Further alternatives for transmitting signals between electronic components may also include utilizing radio waves such as wi-fi, RFID or Bluetooth, proximity sensor, motion sensor or other infrared may also be used or other known wireless methods of communication.

[0075] Electrical components may be placed in communication with one another through the use of various circuits. In the preferred embodiment a power circuit and drive circuit is used to communicate between the power supply 301, microcontroller 302 and motor 304. In one embodiment the step of communicating between the microcontroller 302 and the motor 304 may include supplying power through the power circuit to the microcontroller 302 and the motor 304. The microcontroller 302 may send voltages and signals through the drive circuit to the motor 304 thus controlling the motor output including motor speed, direction, timing and length of stroke. During the step of communicating with the microcontroller, the motor 304 may receive electrical signals produced by the microcontroller 302 and the motor 304 may translate those electrical signals provided through conductive means such as a wire, into a mechanical output. In the preferred embodiment, the mechanical output is the rotation of the motor’s 304 drive shaft. In the preferred embodiment, the motor 304 may be a DC motor. DC motors may include servo motors, shunt motors, separately excited motors, series motors, permanent magnet DC (PMDc) and compound motors. In alternative embodiments the motor 304 may be selected from a group consisting of stepper motors, brushless DC motors, hysteresis motors, reluctance motors, universal motors induction motors and/or synchronous motors.

[0076] In the preferred embodiment, communication with the microcontroller 302 may result in physical movement of the motor 304. The step of moving the motor may depend on the type of motor 304 used. For example a servo motor may be used wherein the desired movement of the control arm 111 is in a pendulum motion and/or twisting motion along a pivot point. In an alternative embodiment depicted in FIG. 11 and FIG. 12, a first motor box 101 may be placed in communication with a second motor box 1230, preferably by a conductive means such as wire 1260. The two motor boxes 101 and 1230 are preferably equipped with servo motors and may be used together to articulate movement is both a pendulum fashion and a motion toward or away from the user. In yet another alternative embodiment a stepper motor may be used if the target system 100 is desired to be moved gradually along a fixed path. The target system 100 is not limited to a single motor or motor type; alternative embodiments may use any combination of one or more motors to achieve the desired movement or movements of the target system 100.

[0077] Using the preferred method, the input mechanism 305 may be placed in communication with an outside source such as a signal sent to a wireless receiver, computer, cell phone, tablet or other device capable of sending a signal to the input mechanism 305. Alternative methods for supplying a signal may include a master remote control 700 capable of individually sending a signal to a receiver and/or multiple receivers simultaneously or in the alternative the master remote control may supply independent signals to each input mechanism. Alternatively, the outside source or signal may include manual force upon a button or dial which engages or communicates to the power supply 301 that an electrical signal may be sent to the microcontroller 302 and/or motor. In the preferred embodiment, the power supply, once initiated may supply the microcontroller 302 with electrical current or a voltage. The microcontroller 302 may also send electrical signals to the motor 304.

[0078] The preferred method of placing the microcontroller 302 in communication with the motor 304 is by electrical wires. Any number of wires, thickness, gauge or length of wire may be used which can effectively communicate with the motor to begin or cease operations of a programmed instruction. In the preferred embodiment, the microcontroller 302 is placed in communication with the motor 304 by three wires. The wires may include a ground, a power, and a signal
wire. Alternatively a single power wire may be used to initiate and communicate with the motor 304.

[0079] The method of moving a target system 100 may also include a step of affixing the target system to a surface, for example to increase stability. The motor box 101 may be vertically mounted by attaching mounting hardware to a mounting bracket fixed on the motor box 101 thus securely fastening the mounting bracket to a mounting surface. Mounting hardware may include nuts, bolts, washers, clips, staples, screws, nails or any other hardware commonly known to attach brackets to a surface. The target system 100 may be mounted to a mounting surface which may include a wall, ceiling, beam, lateral cable or any other surface which may support a suspended target system 100. The target system 100 may be mounted in any orientation and is not limited to being mounted in a vertical position. For example the target system 100 may be mounted to mounting surface perpendicular to the Earth’s surface such as a pole or column.

[0080] Under the preferred method for moving a target system 100, the microcontroller 302 may be programmable. The step of programming a microcontroller 302 may be done by pre-programming the microcontroller directly from the manufacturer or by the end-user in any known programming language including but not limited to deliver instructions may include C#, C, C++, PHP, Java, Javascript, AJAX, Perl, Ruby, Python, Visual Basic, VB.net. The step of programming the microcontroller may include generating or modifying source code and/or saving or deleting instructions to the microcontroller 302 which may provide instructions for an operating mode. The instructions may be saved directly to the microcontroller memory. Multiple sets of instructions may be saved and recalled by the user as an operating mode of the target system 100. Each operating mode may include customizable settings as variables such as motor 304 speed, the timing for which a motor 304 will initiate the operating mode or cease functioning, the intervals at which a motor 304 will change its speed, direction or the length of the motor stroke, the angles the target will swing, the resting period between the height of the swing, the angle and speed of the target system’s 110 rotational or twisting motion or any combination of these parameters. The step of programming may include writing, saving, deleting, or modifying an operating mode saved to microcontroller 302. The step of programming the microcontroller 302 may further include generating any sequence of coded instructions that can be inserted into the microcontroller 302 or any other mechanism which may replace the microcontroller such as computers, tablets, cell phones, laptops, arduinos or any other computing device.

[0081] In alternative embodiments, the step of programming a microcontroller 302 may further include programming one or more computers 901, cellular phones, tablets or a combination thereof, running programmable software and operatively capable of sending a signal to the motor box 101 which may manipulate the power system 301, the power circuit and/or drive circuit.

[0082] The method of moving a target may further include the step of connecting a control arm 111 to the motor box 101. In the preferred embodiment, the control arm 111 may be attached to the motor box’s splined gear 121. The splined gear 121 may contain externally facing teeth or ridges. In the preferred embodiment the act of connecting may include interlocking the external tooth splined gear 121 with a splined hub 122. In the preferred embodiment of this mated connection, the control arm 111 includes an integrated splined hub 121 which may protrude from the backside of control arm 111. In the preferred embodiment, the external splined gear 121 mates with an internal teeth of the splined hub 122 by placing the splined hub 122 over the external teeth of the splined gear 121. Once mated, the output force of the motor 304 may be transferred by the external teeth of the splined gear 121 to the internal teeth of the splined hub 122 thus providing motion to the control arm 111. In the preferred embodiment, once connected the splined gear 121 may rotate the control arm 111 clockwise or counterclockwise in any varying degree motion, including 360° of rotation or more. In an alternative embodiment, the splined hub 122 may have external radial protrusions which are connected with the internal radial protrusions of the splined gear 121.

[0083] In alternative embodiments of the method of moving a target, the step of connecting may include interlocking one or more splined gears 121, 1221 which may be used in tandem or separately to rotate the control arm in a twisting motion, or toward and/or away from the user rather than an arcing pendulum motion. Alternatively, the step of connecting a control arm to a motor may include multiple motor boxes 101 and 1230 communicatively attached to one another via a conductive means such as a wire 1260. In the preferred embodiment, the step of connecting may include a first motor box 101 outfitted with a swivel apparatus 1250 attaching to a splined gear 121 through a screw or opposing splined hub attached to the swivel 1250. The swivel may further include a mounting bracket 1240 for fastening the second motor box 1230. In the preferred embodiment, the step of connecting may include the second motor box 1230 being fastened to the swivel’s 1250 bracket 1240 using screws threaded through a bore 1241. The second motor box 1230 may then be attached to a second splined gear 1221 capable of receiving a control arm 111.

[0084] The preferred method of connecting the control arm to the motor box 101 may include passing through a splined hub 122 connecting hardware 503 which may include a central bore of the splined hub 122. In the preferred embodiment 600 the connecting hardware 503 may be a screw. Connecting hardware 503 is not limited to screws and alternative embodiments may include nuts, bolts, washers, clips, staples, fasteners, nails, rivets, pins, or any other hardware commonly known to fasten two materials together. In the preferred embodiment 600, the connecting hardware may pass through the splined hub 122 of control arm 111. Connecting hardware 503 passes through the splined hub 122 and through a central portion of the splined gear 604. Once properly threaded through the bore, the step of connecting may include tightening the connecting hardware affixed to the control arm 111 in order to securely affix the control arm to the motor box 101.

[0085] The method of moving a target may further include the step of attaching a target surface 110 to a control arm 111. In the preferred embodiment the method for attaching the target surface 110 includes utilizing at least one groove of the control arm 111. In the preferred embodiment the target surface may be held in place to a control arm 111 by a first groove 402 and/or a second groove 403. In the preferred embodiment the first and second groove may intersect perpendicularly at a right angle forming an upper case “T” shape. In alternative embodiments the grooves may intersect at various angles and form any shape desired. The first and second groove may aid in attaching the target surface to the control arm providing space which may hold or secure the target surface 110. In addition, the intersecting grooves 402 and 403 may further
include at least one flange for aiding in securing the target base 113 and target surface 110 to the control arm 111. In the preferred embodiment, the first groove 402 and the second groove have flanges along their edges. The control arm 111 may include a first flange 107 running along the top edge of the first groove 402. The control arm 111 may further comprise a parallel flange 108 running along the opposite side of the first groove 402. This embodiment may also include flanges running along the edge of the second groove 403. In the preferred embodiment, the first intersecting flange 109 and second intersecting flange 112 may be aligned perpendicular to the flanges of the first groove 402. In alternative embodiments, the first intersecting flange 109 and second intersecting flange 112 may be aligned at any angle incident to the first groove 402.

[0086] The flange 107 may include a U-shaped hook for attaching the target base 113 to the control arm 111 or it may include a flange 107 perpendicular to the first groove 402. The shape of the flange is not limited to these shapes and alternatively the flange may intersect with the first groove 402 at any angle of incidence desired for attaching, securing and fastening the target surface base 113. The flange 107 or the parallel flange 108 may employ any of these shapes and may be used in combination with flange 107 to further secure or provide additional attachment points of the target surface 110 or target surface base 113. It is not necessary that opposing flanges include the same shape, but in fact opposing flanges may include a combination of shapes. The intersecting flange 109 and 112 may also employ the shapes described pertaining to the flange 107 and parallel flange 108. Accordingly these intersecting flanges may employ a combination of flange shapes which may be the same as or different from each other and the flange shape of the first groove 402.

[0087] Alternatively, the step of attaching the target surface 110 to the control arm 111 may include other embodiments which may incorporate other means to attach the target surface 110 to the control arm 111. The means for attaching the target surface 110 to the control arm 111 may also include hooks, nuts, bolts, washers, loop fasteners, pins, nails, staples, screws, adhesives, glue or any known method of fastening one material to another. These alternative embodiments may be used separately from or in conjunction with the intersecting grooves 402 and 403 and the previously described flanges 107, 108, 109 and 112.

[0088] The method for attaching the target surface 110 to the control arm 111 may include using the shape of the control arm 111 to bias the target surface base 113 against the structural features of the control arm 111. In the preferred embodiment of attaching, a first side of the target surface base 113A may be fitted or pressed against the interior side of flange 107, preferably at about a 45 degree angle of incidence with the first groove 402. The shape of flange 107 may hold the first side of the target surface base 113A in place within the first groove 402. The second side of the target surface base 113B may be securely mated with parallel flange 108. Similar to the first side of the target surface base 113A, the second side of the target surface base 113B may be fitted against the interior portion of the parallel flange 108. The shape of the parallel flange 108 may hold the second side of the target surface base 113B in place within the first groove 402. In order to make the proper interconnection, the second side of the target surface base 113B may be deformed or manipulated into position between the parallel flange 108 and the first groove 402. Once properly in position between the parallel flange 108 and the first groove 402, the second side of the target base 113 may be reformed back into its original shape. Upon reformation of the second side of the target base, it is preferred that the target base 113 may lie securely and flush within the first groove 402.

[0089] In an alternative method of attaching, the target surface 110 to the control arm 111, the reverse order of the preferred method may be used. Depending on the method used for inserting the target surface base 113, a user attaching the target may deform either the first side of the target surface base 113A or the second side of the target surface base 113B to facilitate easier attachment or removal. In this alternative method of installation, the target base 113 may be angled into the control arm by first mating the second side of the target base 113B against interior portion of the parallel flange 108. The first side of the target base 113A may be deformed as necessary to angle the rigid yet flexible material, against the interior portion of the flange 107. Once the first side of the target base is in position between the interior portion of the flange 107 and the first groove 402, the first side of the target base 113 may be reformed back into its original shape. Upon reformation of the first side of the target base, it is preferred that the target base 113 lies securely and flush within the first groove 402.

[0090] In the preferred embodiment, once the target base 113 has been securely attached into the first groove 402 of the control arm 111, the target neck 114 may then naturally fall flatly within the second groove 403. The first intersecting flange 109 and opposing intersecting flange 112 may provide extra stability once attached while the target system initiates operation.

[0091] The method for moving a target may further include a step of supplying a signal to a microcontroller wherein the microcontroller 302 executes at least one set of the programmed instructions. A signal may be supplied to the microcontroller 302 by any known means for initiating the power supply 301 or any means known to change the operating mode of the target system 100. Such means for supplying a signal may include a button or touchscreen 102 and/or a dial 103. In one embodiment for supplying a signal, manipulating the dial may be one means for increasing the voltage supplied to the interior components of the motor box 101, including the microcontroller 302 which may respond to the increased voltage by executing a set of programmed instructions in accordance with the microcontroller’s programming. For example the signal sent may instruct the microcontroller to increase the frequency of signals to send to the motor 304 and thus may ultimately increase the output signal to the motor 304. In this preferred embodiment, the button 102 may initiate the power system and the dial 103 may control operating mode variables including but not limited to motor speed, direction and timing.

[0092] In an alternative embodiment, the step of supplying a signal may include supplying and receiving a signal from a wireless transmitter, controlled by an input device or input mechanism such as a remote control 700. A signal may be transmitted through a wired or wireless connection. A wireless signal may be sent from a remote control 700 to the wireless receiver 902. The remote control 700, input mechanism 305 or wireless transmitter 902 may be using an infrared frequency or a radio frequency (RF) such as Wi-Fi or Bluetooth and may be received by a wired or wireless receiver 901 which may be equipped with a sensor. In another embodiment, the receiver may be directly connected to the input device through such means as a wire, USB cable or network
cable directly plugged into the receiver 901. The input device is not limited to handheld remote controls 700 but in alternative embodiments may also include one or more computers 901, tablets, cellular telephones, or other device capable of sending signals to a receiver 902. For example a smartphone may be equipped with an application or program (an “app”) which may generate a signal sent to the receiver and may be used as a controller 700. In additional embodiments, the input mechanism 305 may supply a signal using RFID tags. The RFID tag may be attached to an individual such as the user, third party or the RFID tag may be attached to an object, such as a pre-selected weapon. In the preferred embodiment featuring the RFID control mechanism, when the RFID tagged individual or object comes within a specified distance from the input mechanism 305, the system 900 may receive a signal to initiate operation. In the alternative, the RFID tag may supply the signal once an individual or object’s orientation of the tag in proximity to the input mechanism 305 is properly aligned in a programmed position that is recognized by a receiver. For example raising a firearm in a position wherein the firearm ready is to be discharged may initiate the power supply 301.

[0093] The step of supplying a signal to execute at least one instruction may include in one embodiment initiating via an input mechanism 305 one or more operating modes. In the preferred embodiment, the microcontroller 302 may be pre-programmed with many different operating modes which may be selected by the user. Operating modes may each include custom settings. Customizable settings may include variables such as motor 304 speed, the timing for which a motor 304 will initiate the operating mode or cease functioning, the intervals at which a motor 304 will change its speed, direction or the length of the motor stroke, the angles the target will swing, the resting period between the height of the swing, the angle and speed of the target surface’s 110 rotational or twisting motion or any combination of these parameters. In an alternative embodiment, the target system 100 may be adapted to include vertical (up and down) movement as well, such as along a Y-axis. A target system 100 may also include an in and out movement along an X-axis. The step of supplying a signal may include in one embodiment initiate a sequence of operating modes. The sequence of operating modes may initiate one after another or may include a rest period in between each operating mode. The rest period may be a pre-programmed time limit or may be controlled by the active user and/or third party. In yet another alternative embodiment, the microcontroller 302 may select an operating mode at random upon initiation of the power supply 301 by the input mechanism 305. Any of the aforementioned embodiments may utilize lights, sounds or a combination thereof to signal the initiation, completion and/or change in operating mode. Embodiments of target system 100 may also utilize lights, sounds and combinations thereof during operating modes in a preset or random fashion to further disrupt concentration and enhance the training of the user.

[0094] The method for moving a target may include the step of supplying a signal to execute at least one instruction for multiple target English surfaces controlled by motors 306 and 307. In this embodiment the first motor box 801 may contain a microcontroller 302, a power supply 301 and a power circuit and/or drive circuit. The first motor box 801 may also be capable of receiving a signal from the input mechanism 305. The microcontroller 302 may control both motor A 306 housed in motor box 801 and motor B 307 housed in the second motor box 810. The output from the microcontroller 302 may be transferred from motor box 801 to motor box 810 through conductive means or wireless transmission. The preferred conductive means are wire 804. In an alternative embodiment, motor box 801 and 810 may include two separate and complete motor boxes acting in conjunction with each other upon receiving a signal supplied by one or more input mechanisms 305. In the preferred embodiment of the multiple target system 800, a microcontroller 302 may be programmed to independently control each motor 801 and 810 with separate sets of instructions, ultimately independently controlling the position of each control arm 807 and 813 independently. Accordingly, the parameters described above including speed, angle of the target surface, start and stop time, and stroke of the motor may be independent from each of the other motors 801 and 810 in the array of motors.

We claim:
1. A target practice system comprising:
   a target surface;
   a control arm capable of receiving and securing the target surface;
   a motor capable of changing the target surface’s position; and
   a microcontroller directing the motor’s output.
2. The system of claim 1 wherein the control arm further comprises a first flange and a second flange parallel to the first flange.
3. The system of claim 1 wherein the control arm is T-shaped.
4. The system of claim 1 wherein the target surface is constructed from a material selected from a group consisting of paper, plastic, wood, cardboard, foam and a combination thereof.
5. The system of claim 1 wherein the target surface is designed to accommodate arrows and/or bolts.
6. The system of claim 1 wherein the target surface is reflective.
7. The system of claim 1 further comprising a second motor connected to the motor capable of changing the target arm’s position.
8. The system of claim 7 wherein the second motor is connected to a second control arm.
9. The system of claim 1 wherein the motor is selected from a group consisting of a servo motor, stepper motor, shunt motor and brushless DC motor.
10. The system of claim 1 wherein the motor is capable of changing the control arm’s position greater than 1°.
11. The system of claim 1 wherein the motor is capable of changing the control arm’s orientation toward a user motion by greater than 1°.
12. The system of claim 1 wherein the microcontroller is encoded with programmable software.
13. The system of claim 12 wherein the microcontroller is an Arduino.
14. The system of claim 12 wherein the programmable software is programmed in a language selected from a group consisting of C, C++, Perl, Java, Javascript, Visual Basic, PHP, Ruby, Python and a combination thereof.
15. The system of claim 1 further comprising an input device capable of sending a signal to the microcontroller.
16. The system of claim 15 wherein the input device is selected from a group consisting of a remote control, computer, tablet, RFID, cellular telephone and a combination thereof.

17. The system of claim 1 further comprising at least one power system to the microcontroller.

18. The system of claim 17 wherein the power system is portable.

19. A method for moving a target comprising the steps of: placing the microcontroller in communication with a motor; programming a microcontroller with at least one set of instructions to control the motor; connecting a control arm to the motor; attaching a target surface to the control arm; and supplying a signal to the microcontroller to execute at least one of the at least one set of instructions.

20. The method of claim 19 wherein the at least one set of instructions controlling the motor includes at least one variable wherein the variable is selected from a group consisting of change in motor speed, motor timing, motor direction and length of motor stroke and a combination thereof.

21. The method of claim 19 wherein the step of programming at least one set of instructions, comprises two or more sets of instructions.

22. The method of claim 21 wherein the step of supplying a signal to the microcontroller to execute at least one of the at least one set of instructions further comprises executing two or more sets of instructions sequentially.

23. An apparatus for securing a target surface comprising: at least one pair of intersecting grooves, wherein the at least one pair of intersecting grooves include at least one flange interlocking with the target surface.

24. The apparatus of claim 23 wherein the at least one pair of intersecting grooves intersect at a right angle.

25. The apparatus of claim 24 wherein the at least one pair of intersecting grooves intersect to form a T-shape.

26. The apparatus of claim 23 wherein the at least one pair of intersecting grooves further comprises:
   a flange formed at a first edge of the first intersecting groove; and
   a parallel flange opposite the flange, formed along a second edge of the first intersecting groove.

27. The apparatus of claim 26 wherein the at least one pair of intersecting grooves further comprises:
   a flange formed along a first edge of a second intersecting groove; and
   a parallel flange opposite the flange formed along the first edge of the second interconnecting groove.

28. The apparatus of claim 23 wherein the apparatus is constructed from a material selected from the group consisting of metal, plastic, wood, hardened rubber and a combination thereof.

29. A method for securing a target surface to a control arm comprising:
   interlocking a first side of a target surface with a first side of a control arm; and
   interlocking a second side of the target surface against a second side of the control arm.

30. The method of claim 29 further comprising the steps of:
   deforming the second side of the target surface; and
   reforming the second side of the target surface.

31. An apparatus for target practice comprising:
   a removable target surface;
   a control arm; and
   a means for securing the target surface to the control arm.

* * * * *