Claims

1. A Fully Automatic Self-contained AI based Laser Light Pest Deterrent System (L2PD) device for deterring birds from at least a portion of an object comprising of an external frame, sensory members further comprising of first member visual sensor and a second member audible sensor, AL analytic software for processing the image/ audio into visual recognition of classifier as human or bird, further comprising of deterrent members of first low level laser gun/s aimed at area below the device operable by visual recognition, and second high level laser gun/s aimed at object above the device.

2. A device according to claim 1, where the object is an indoor structure such as cafeteria, food court, food wholesaler, etc where the device is used to deter pest primarily Birds from roosting and scavenging for food.

3. A device according to claim 1, where external frame is a capsule shape body, comprising of a first member turret base dust free cover with the dome surface facing upwards, a second member inverted turret body dust free cover with the dome surface facing downwards both of which are held together by a third member steel hollow stem pierced into the apex of the dome of the turret base, is used to suspend the external frame to the indoor structure at high level at height of about 3m or higher, when measured from the floor at the edge / corner of the area of protection.

4. A device according to claim 1 where the external frame is factory finished in gloss coloured acrylic designed to be dust free, and the dome shape top of the turret base is design to prevent dust collection and landing/ roosting of any bird onto it.

5. A device according to claim 1 and 3, where the abovementioned first member steel hollow stem of 50mm diameter x minimum 1.5mm thick, is machine threaded at its lower end is used to receive a second member threaded nut/s, placed below the third member ball bearing castor to support the entire weight of the device.

6. A device according to claim 1 and 3, where the abovementioned steel stem is secured firmly to the structure with a second member base plate that allow the entire device to be adjusted to true plumb and level. The lower end of the stem shall be chamfered for electrical cable from electrical appliances inside the turret, a first member EPDM or equal prop hood grommet at about the turret base height, designed for protection of cable from electrical appliance/s inside the turret base, a second member hood EPDM / rubber grommet with steel cable conduit. The configuration of the above grommet, cable penetration or such will prevent the entry of water or small pest/s like lizard, roaches, etc from entering the steel stem.

7. A device according to claim 1 and 3, where the inverted turret has a vertical embrasure for a first member 25mm internal diameter laser gun/s at front of the turret and the said embrasure is covered with a second member 1mm thick rubber sheet stuck to the inside of the turret designed to prevent the entry of water or small pest/s like lizard, roaches, etc from entering the device through the turret.

8. A device according to claim 1 and 7, where the first member laser gun/s has the following characteristics of second Class 2 or lower, third beam colour of green and/ blue, fourth frequencies of 380 Nm to 600 Nm, fifth power rating: $\leq$1 Watts.

9. A device according to claim 1 and 3, where the turret base is fitted with openings for a first member 25mm internal diameter noise cancelling condensing microphone at front of the turret base, a second member 25mm internal diameter fast strobe light indicator, a third member 25mm diameter emergency stop button (kill switch), a fourth member overall shaped aperture with a projecting canopy fitted with a removable clear acrylic/ glass len cover (for high level laser gun/s), a fifth member rectangular aperture next to the abovementioned microphone, that is fitted with a 2mm thick removable clear acrylic/ glass len cover (for CCTV camera) and a sixth member removable fibreglass cover. A means of securing the abovementioned removable cover/s by means of fixing chrome finished nut rivet of minimum 5mm inner diameter onto the turret base to accept minimum 5mm diameter x 12mm long socket hex head screw at each corner of the said cover without the use of any silicone/ similar sealant. A means of ensuring tight fit between the surface of the turret base and the abovementioned cover using EPDM or equal gasket where configuration of the above aperture, openings, embrasure, etc will prevent the entry of small pest/s like lizard, roaches, etc from entering the device through the turret body

10. A device according to claim 1 and 3, where the turret base further comprise of the first member dust free dome cover, with larger radii skirting to provide continuous dust free cover to the turret below, a second steel base support plate, fixed to a third steel skew ring across the perimeter of the support plate, a fourth sealed for life ball bearing castor fitted to the middle of the support plate which has an inner diameter hole that is slightly larger than the abovementioned round steel hollow stem, a fifth arc shape rack with inner gear which is placed vertically, welded to a sixth bespoke pivot plate which tied to a seventh pinion used to control the angle of beam projection for the eighth laser gun/s mounted onto the abovementioned pivot plate. A ninth ring shaped holder approximately 25mm internal diameter with 3mm thick flexible rubber grommet used to provide support for the stem of the abovementioned laser gun/s which is further secured at its end by a tenth neodymium magnet type power adapter.

11. A device according to claim 1 and claim 5 where the abovementioned power adapter is secured to the pivot plate will allow for magnetic connection of the power source to the laser gun/s without the need for physical screws/ bolts and fast connection to the direct current power supplies, which when activated will project laser beams from the abovementioned laser gun/s. If the laser diopter, len, circuit or any part of the laser gun/s is faulty, it can be dismantled by pulling the entire gun/s outwards from the device without the need to remove any screw/s or bolt/s and replacing with new laser gun/s, assuming there is no serviceable parts for the laser gun/s.

12. A device according to claim 1 and 11, which is a vibration Integrated Circuit chipset affixed to the abovementioned pivot plate and is powered simultaneously with the abovementioned laser gun to cause an erratic light beam emission designed to confuse the bird of an imminent threat from an approaching predator.

13. A device according to claim 1 which is a separate Local Motor Control Panel (LMCP) that is connected to the abovementioned Device A30, comprising of a first electrical circuit breaker for incoming power supplies, to power the second step down transformer (and intelligent battery charger 110VAC/ 220VAC to 12VDC), used to operate the third Central Processing Unit (CPU), fourth 12VDC panel cooler fan, fifth LED Indicator Lights, sixth key test switch, seventh three-line LCD display, eighth timer controller, ninth sealed-lead acid batteries and enclosed in tenth steel constructed enclosure.

14. A device according to claim 1 and 12, an Artificial Intelligence (AI) analytic software in the form of first faster Regional-Convolution Neutral Network (R-CNN) logic structure, will be coded and embedded into the said CPU, where second coding of linear Support Vector Machine (SVM) classifier will enable the identification of classifier like third humans (only head and top torso) and fourth birds. The classifier for both human and bird involves shape scalability and size. Where additional classifier for fire is involved, this involve size, orange/ red colour and texture (smoke).

15. A device according to claim 1 and 12, where the abovementioned AI analytic software would be programmed on site to create first pre-Trained visual bounding box which will be based on the area of protection and compared against second new images based on each iteration of frame-works per seconds (fps) for classifiers humans and/ birds.

16. A device according to claim 1 and 12, where the abovementioned AI analytic software would be programmed on site to create first pre-Trained audible bounding box which will be based on the nearby environment and compared against third new audible signals for classifier birds.

17. A device according to claim 1 and 15, where classifier Birds are visually identified by the first abovementioned CPU via the second abovementioned CCTV camera, an output supply shall be provided to the third low-level laser gun and fourth vibration chip via fifth timer controller to emit a laser light beam for a duration of about seven (7) seconds at the target area. Where the classifier Birds continue to be detected after ten (10) seconds has expired after the preceding event, a following emission of laser light beam will be made. Where the classifier Birds are no longer detected after the preceding event, the device will reset to original status.

18. A device according to claim 1 and 15, where classifier Birds are visually identified by the first abovementioned CPU via the second abovementioned CCTV camera, and third the target area represent a smaller portion of the area of portion, an output supply shall be provided to the fourth servo motors inside the device in x- axis first follow by y-axis to oscillate the orientation of the fifth low-level laser gun/s to the target area where the birds are present before the output power for laser guns/s are activated as above mentioned. Where birds are located in another target area, the output supplies to the device for the servo motors shall oscillate the said laser gun/s to the new position and activate these gun/s accordingly.

19. A device according to claim 1 and 15, where classifier Human and Birds are visually identified by the first abovementioned CPU via the second abovementioned CCTV camera, and third target area, the above laser gun/s may be activated provided any human located in the target area, especially if intimate with the device is not looking at the device and may be affected by the laser light beam, then the said laser gun/s may be automatically de-energized.

20. A device according to claim 1 and 14, where fire is detection at or around the area of protection, the first strobe light shall be activated and second output contacts (voltage free/ 12 VDC) can be sent to a third fire alarm sounder or fourth DeCentralized Alarm Monitoring Company (DECAM) via fifth SIM card module or land line.

21. A device according to claim 1 and 19, where first Human may be intimate with the second device but the self-disabling of laser gun/s fail to de-energized, Human has to option to activate the emergency kill switch to shut down the device entirely.

22. A device according to claim 1 and 16, where classifier Birds are visually identified by the first abovementioned CPU via the second abovementioned condensing microphone, an output power supply shall be provided to the third high-level laser gun/s for a duration of about ten (10) seconds.

23. A device according to claim 1, claim 3 and 15, where the first mounting element is a self-automated navigable machinery that travel on predefined route, the second device is installed per inverted orientation where the third turret base is below the fourth turret, and the fifth CCTV camera is re-orientated upwards. Where fire detection option is exercised, the self-preservation mode shall be activated and navigate the machinery to safety outside of the area of protection.

24. A device according to claim 1, claim 3 and claim 16, where a simplified version that is not sensitive to presence of human, the device shall be mounted mid axis of the area of protection in lieu of mounting at edge of area of protection, it shall use a first condensing microphone for detection of birds and have second low-level laser gun/s and third high-level laser gun/s. Where the audible sensors are activated, the laser gun/s at both high-level and low-level shall be activated simultaneously for about ten (10) seconds.

25. Coverage of single device
A device according to claim 1, 15 and 18, where the CCTV surveillance camera deployed in the apparatus is a fixed type IP based camera used primarily to protect low level area below the apparatus. Referring Figure 7 and Figure 8 below, if the Area of Protection required is small, e.g. 30m distance x 8m wide, a single apparatus may be sufficient to protect the area. The area of protection can be calibrated by angle of view, sensor size and focus length. Referring to Figure 7 and Figure 8 below demonstrate the coverage of a single apparatus but the vulnerability of such an installation is the coverage of the camera limited by it's field of view which can be overcome with another apparatus placed at opposed diagonal position that will counter each other's deficiencies.

When the area of Protection is much longer or wider than bounding box of the apparatus, a single device may not be possible to carry out a full coverage. To overcome this, a pre-Engineered approach is used to overcome these limitations such a blind spot through collective arrangement of apparatus for a holistic coverage of the Target area to match the area of Protection.

26. Wall or physical obstruction
A device according to claim 1, 15 and 18, where the bounding box may be formed by external walls to the structure as per Figure 10 & 11.. Surveillance of human/ birds at the camera excess area based on theoretical angle may be excluded from design consideration as the camera view are blocked by the wall. Only the target area within the bounding box is considered for AI analytic.