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The Robotic System Achievement of Rugged Mobile Non-Intrusive Imaging Inspection System

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Abstract. The Lagrangian Deformable Tensor Software(LDTS)Protocol is a mathematical technique which realizes many of the new sensor imaging concerns from Terrorists since 9/11. The rugged mobile non-intrusive imaging inspection system for vehicle interiors and cargo areas goals require prediction of motion, weight and sensitivity perturbation in a three dimensional perspective and must be modeled by a Lagrangian Deformable Tensor equation within the LDTS Protocol for detection of explosives, biological, and chemical agents in containers in concrete and other construction materials for rugged mobile non-intrusive imaging inspection systems. The LDTS Protocol contains the mathematical complexity to interpret the imagery content of containers for Global Information Grid(GIG)CIA Simulation and Intelligence interpretation and response to protect humanity from Terrorist threats from IED single or multiple Bombers via a Robotic YOYO Device for bomb disposal, a portable device that is handheld and capable of imaging a briefcase-sized object for interior explosive detection at one pass with single-sided imaging capability with the high resolution provided by the LDTS Protocol. The additional Heart Protocol Geometric Software Structure links the LDTS Geometric Software Structure to the two Sensor Hardware Geometric Structures,i.e. the Overlayed Circular Sensor Structure and the Cross Sensor Structure. The basic Robotic YOYO model enables image sensing in place with the singing property of the YOYO from the sensors in the periphery of the Overlayed Circular Sensor Structure shaped device with overlayed larger diameter sections, and the Cross Sensor Structure with the circular sections containing sensors at the edge of each arm of the Cross Sensor Structure. This sensing property enables placement of this Robotic YOYO System on the floor of vehicle or chamber to track a Terrorist suspect and has either wired or wireless communication with other Robotic Devices or Security Personnel. The Robotic YOYO System, which uses the YOYO singing property to establish the length of the sensing time correlated to each Terrorist Threat, is an evidence-based knowledge tool enhancing the administration of justice and public safety for guiding policy and practice.

Keywords: sensor imaging; Lagrangian Deformable Tensor Software(LDTS); sensitivity perturbation;bomb disposal; Robotic YOYO Device; Cross Sensor Structure; detection of explosives; detection of biological agents; detection of chemical agents

1. Introduction

1.1. Sensor/GIG Simulation Facility Timing Chart Topological Basis

In the Homeland Defense and Security software protocol topology sections referenced in Figure 1, the LDTS Protocol connects the Global Information Grid(GIG) to the Terrorist Detection Sensors via its linkage to the HDSUIS(Homeland Defense and Security Universal Interface Software) Protocol, and the Catastrophic Critical Point Detection Prediction(CCPDP) Protocol and the Catastrophe Theory Partition Attachment(CTPA) Protocol. The max-min theory of the CTPA Protocol located at the other end of the Homeland Defense and Security Software Protocol Topology is linked to the Enhancement section of the HDSUIS Protocol, the Gateway Protocol.

The problem under investigation is the completion of a Robotic YOYO device for bomb disposal, which is controlled by the LDTS Protocol software. The Robotic YOYO hardware controlled by the LDTS Protocol Software Concept will cover a wavelet, physics and mechanically oriented mathematical simulation and performance evaluation of the combination of the hardware and software theory for Robotic Bomb Disposal. The development of the correlated Robotic YOYO hardware depends on the extent of the high resolution imaging capability of the sensors mounted within the Robotic YOYO structure and the high resolution sensor capability.

The LDTS Protocol geometric software theory follows. The top sections of the LDTS Geometric Software Structure, the Asscher Cut is the LDT property sections and the four fractal isosceles triangle sections, i.e.,sensitivity and perturbation, image processing, delay optimization and game theory. The Threshold Stabilization Theory is the basic theory for the linkage of the LDTS Protocol to the HDSUIS Protocol and is represented in the lower level of the LDTS Geometric Software Structure. The Catastrophe Theory Enhancement of the CTPA Protocol through the Min-Max and Max-Min Theory[1] is an enhancement to the HDSUIS Protocol. The HDSUIS Protocol requires the LDTS Intelligence Equation[15] to establish Threshold Stabilization to prevent extreme Catastrophe and will identify the exact timing of events in a section where a clock establishes the main time within a chart.

This timing chart enables the capability for the LDTS Protocol to establish a record of the following events occurring during the linkage of the Terrorist Sensor data via the LDTS Protocol to the GIG[12]. Timing Event 1**.** The time at which the terrorist sensor images interpreted by the LDTS Protocol transmitted this information to the GIG through the HDSUIS Gateway Protocol and the CCPDP Protocol[8] and the CTPA Protocol at the border to the GIG Simulation facility. Timing Event 2. The time when the GIG received the imaging information from the LDTS Protocol. Timing Event 3**.** The time that it was required for the GIG to perform an intelligence lookup for the imaging information from the LDTS Protocol. Timing Event 4. The time when the GIG returns either a request for a new scan of the Terrorist Detection Sensors[9] by the LDTS Protocol or information concerning execution of the demolition of the location of the terrorist explosives or biological or chemical containers. Timing Event 5**.**

If the GIG requires an additional terrorist sensor scan by the LDTS Protocol[12] then the event times are listed in the timing chart that represent Timing Events (1), (2), (3), and (4). Therefore, the Max-Min Lagrangian Equation predicts the events and identifies the timing of the Terrorist Detection and Final Resolution events as opposed to the hardware. Refer to Figure 1 for the location of the LDTS Protocol within the Homeland Defense and Security topological layout of its Protocol Sections. The HDSUIS Protocol[10] Software will create the optimal type of terrorist delay timing information to be transmitter to the GIG for simulation operations.

The delay for this processing of the Terrorist Detection Sensor imagery data via the LDTS Protocol and the other three linking protocols to the GIG can take days, as opposed to the nanosecond response from the Killer Satellite Sensors Protocol linkage to the National Test Bed Simulation Facility Protocol via the Universal Interface Software(UIS) Gateway Protocol[11], for the Strategic Defense Initiative Organization(SDIO) topology. The reason for this delay is the time required in the Timing Events listed above to retrieve the GIG CIA intelligence data, correlated to the high resolution imagery transmitted from the Terrorist sensors to the GIG by the LDTS Protocol via the HDSUIS, CCPDP and CTPA Protocols.

2. LDTS THRESHOLD STABILIZATION FORMALISM

Threshold Stabilization(THS) is defined by the following seven tuple of characteristics:

$$\mathbf{THS = < L, S, S_g, F_m, T_g, T_o, L_r >} \qquad \mathbf{(1)}$$

L = Loop g is defined by internal parameters(x,y) having a spatial significance. **S** = Stratification, due to a transformation and the map $(x,y) \rightarrow (u,x)$ is defined by $u = Vx^x - v = Vy^x$, $\mathbf{S_g}$ = Singularities whose codimensions are too large appear in stable way,$\mathbf{F_m}$= Formal mechanism Dynamic (M,X) undergoes bifurcation in the sense of Hopf. $\mathbf{T_g = T_o}$ = Tools correspond to a smoothing a threshold stabilization between these phases(two phases). $\mathbf{L_r}$ = Localization and Reversibility of Transitions.

3. Four Sierpinski Triangles on Asscher Cut Geometric Structure

A deterministic process can lead through the definition of chaos to something that looks random. A random process can lead to a figure of great regularity. A non-deterministic dynamical process algorithm for constructing a Sierpinski triangle by sequences of random numbers, requires the choice of an equilateral triangle in the plane. The LDTS Protocol realizes the four Equilateral Triangles on the top layer of the Asscher Cut Geometric Software Structure for the LDTS Protocol modeled as Sierpinski Triangles, the fractal[3] theory of Contraction and iterated function systems, describes these triangles at the beginning of the formation of the isosceles triangles that depict each succeeding layer of the Asscher Cut Geometric Software Structure, a concept originally developed for Strategic Defense Initiative Organization(SDIO) for computer node processing speed[11].

The closeup of the four Equilateral Triangles 7,49,28, and 8 in Figure 2 represents the Fractal Definitions within the four Isoceles Triangles on top of the Top Asscher Cut. The LDTS Protocol Geometric Structure Asscher Cut Top Section in Figure 3 contains the 56 LDTS Tensor, Lagrangian Tensor and Lagrangian Deformable Tensor definitions and four Fractal Isoceles Triangles, IT1-Sensitivity And Perturbation Analyses, IT2-Image Processing, IT3-Delay Optimization And IT4-Game Theory. The LDTS Protocol Geometric Asscher Cut Bottom Section in Figure 4 contains the 32 Characteristics of the Threshold

Stabilization Theory. Three dimensional. Holographic Fourier Analysis of the Terrorist Sensor images will interpret the images of these various containers in walls or Terrorists carrying or containing explosives or biological or chemical agents.

4. Queer Differential Equations for LDTS

The LDTS Protocol optimal Intelligence Equation is the multicriterion Lagrangian Deformable Tensor equation with the biochemical and computer networking constraints is the stated in the following equations with the added parameter of sensitivity analysis for a continuous dynamical system. The Optimal Intelligence Equation, the LDTI Intelligence Equation representing the amount of optimal delay for tracking each type of terrorist activity, follows realizing the perturbation sensitivity equation required in the final axisymmetric Lagrangian deformable tensor equation. $R(t, u_o)$ = the solution of a differential equation for a dynamical system with the parameter u, is stated by the Taylor series expansion:

$$\mathbf{R(t, u_o + du) = R(t, u_o) + \partial R/\partial u_o\ \Delta u + \ldots\ldots} \qquad \textbf{(2)}$$

where, u_o = the value of the initial condition of the parameter, and $u_o + \Delta u$ = the value of the tolerance parameter plus the change over an operating range. The total resolution sensitivity function for the system is then represented by,

$$\boldsymbol{\Delta R = \sum_{i=1}^{n} (\partial R/\partial uoi)\ \Delta ui} \qquad \textbf{(3)}$$

where,$\partial R/\partial u_{oi}$ = sensitivity influence coefficient about the operating point of each component parameter,Δu_i = value of the respective parameter tolerance, and $(\partial R/\partial u_{oi})\ \Delta u_i$ = sensitivity function for each system component.

The algebraic solution is a method of directly calculating the sensitivity function for the maximum value when the tolerances are not random during the process or for a worse case approximation. The geometric solution for the statistically independent disturbances involves a vector composition equation. The combination of stresses and deformations must be applied to the perturbation sensitivity equations to form the final Lagrangian Deformable Tensor, which will be an Intelligence Measure of these factors in the imaging detected by the terrorist sensors. A three dimensional stress Tensor T will be a part of the Lagrangian Deformation Tensor. Elasticity is the property of recovery to the original size and shape by recovering from strains. The Cauchy stress equation is $t(n) = T_n$, and the deformation gradient tensor is $F = \partial X/\partial x$, where x is the deformed and perturbed condition (x=x(X,t))and X is the undeformed condition. Therefore X=X(x,t). The inverse of the deformation tensor is $F^{-1} = \partial x/\partial X$. Then the equation for the stress tensor T related to the deformation.

A deformation tensor realizes the change of the distance between points during deformation and sensitivity perturbation. Therefore, the Lagrangian Deformable Tensor E equation also referred to as the Queer Differential Equation, and the Euler Lagrangian Equation is stated:

$$\mathbf{E = (1/2)[C - I]} \qquad \textbf{(4)}$$

where, the left Cauchy-Green strain tensor is defined as $B=FF^T$, where b is symmetric and rotation invariant. The combination of the basic Lagrangian Tensor Equation(4) with the Perturbation Sensitivity component equation (3) yields the sensor LDTS Protocol Lagrangian Deformable Tensor equation realizing the additional Axisymmetric MHD(Magnetohydro-dynamics Equilibria theoretical requirements for boundary conditions to preserve the maximum properties for this Euler Lagrange equation also referenced as the Queer Differential equation. All of these properties are required for the LDTS Lagrangian Deformable Tensor Equation to enable the optimal Intelligence equation for examining the terrorist imaging from sensors to be transmitted to the GIG by the HDSUIS, CTPA and CCPDP Protocols.

The HDSUIS Protocol combines the additional protocol enhancements, alterations and attachments characteristics to the UIS Protocol with the GIG gateway software protocol requirements and the antiterrorist sensor high resolution imaging characteristics in the LDTI Lagrangian Optimization eqn (5) in Figure 5 realizes Timing Events (1),(2),(3), (4) and (5) whose Critical Points will be derived by the CCPDP Protocol, if selected from within the HDSUIS Protocol. Also the LDT Intelligence(LDTI) equation with the LDT Objective Function, eqn (4) contains the perturbation sensitivity[2,5,14]. Refer to Figure 6 for the eleven Lagrange Multiplier Terrorist Threat partial derivative equations, whose solution enables the solution of the LDTI, a delay representing the extent of the Terrorist Threats at any of the Timing Events, i.e.,Robotic YOYO Device Singing Function Lengths correlated to individual Terrorist constraints.

TERRORIST DETECTION SENSORS	**LDTS**	**HDSUIS**	**CCPDP CTPA**	**GIG**

Figure 1 Homeland Defense and Security Protocols Topology

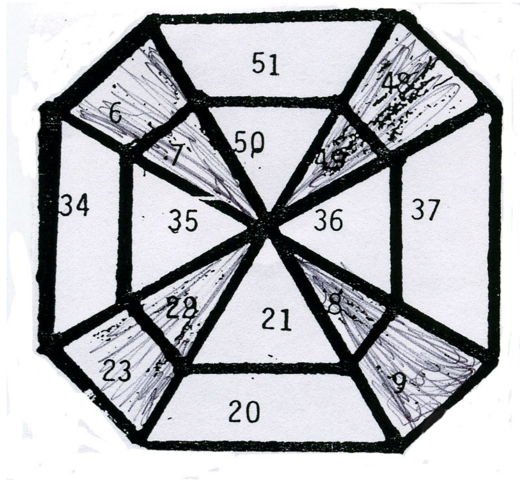


Figure 2 LDTS Protocol Closeup of The Four Equilateral Triangles 7,49,28, and 8 Which Represent The Fractal Definitions Within The Four Isoceles Triangles On Top of the top asscher cut.

5. Three Geometric Software Structures Required For LDTS Software Protocol To Link With Intermediate Heart Protocol And Sensor Hardware Overlay Structure And Cross Structure

Figure 7 represents an overview of the ten sided Heart Geometric Software Structure(Figure 8A) linking the LDTS Protocol and the Sensor Hardware Protocols, i.e. the Sensor Overlay Hardware Geometric Structure(Figure 8B) and the Sensor Cross Hardware Geometric Structure(Figure 8B) that can access ten of the Sensor Hardware Protocol Geometric Structure sensor locations in any of the three levels of twenty circular varying diameter sensor layers at a time in each layer of the sensor hardware, since there are twenty of them in a layer of the Overlay Sensor Hardware Geometric Structure and ten in each arm containing twelve sensors of the Sensor Cross Geometric Structure. These ten Heart Geometric Structure Linking Protocol can access the correlated LDTS Asscher Cut Top Fractal[3] sections ten at a time and the bottom Threshold Stabilization sections ten at a time to effect uate communication between the LDTS Protocol and the Sensor Hardware Geometric Structures to fulfill the Robotic YOYO Concept for the achievement of the rugged mobile non-intrusive imaging inspection system.

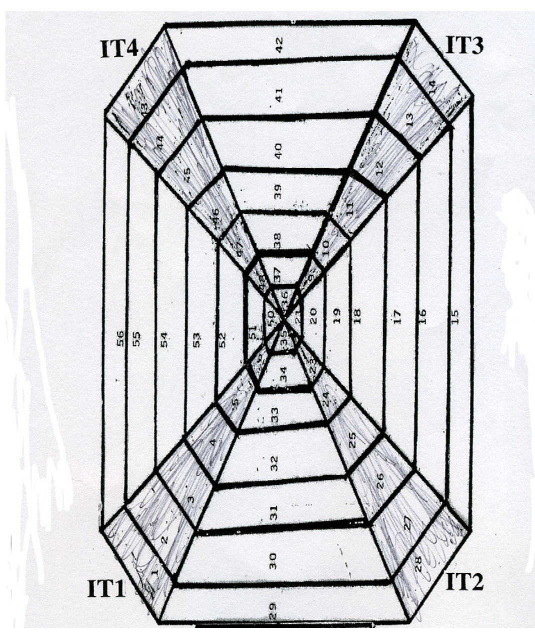


Figure 3 LDST Protocol Geometric Structure Asscher Cut Top Section Containing 56 LDTS Tensor, Lagrangian Tensor and Lagrangian Deformable Tensor Definitions and Four Fractal Isoceles Triangles, IT1-Sensitivity and Perturbation Analyses, IT2-Image Processing, IT3-Delay Optimization and IT4-Game Theory

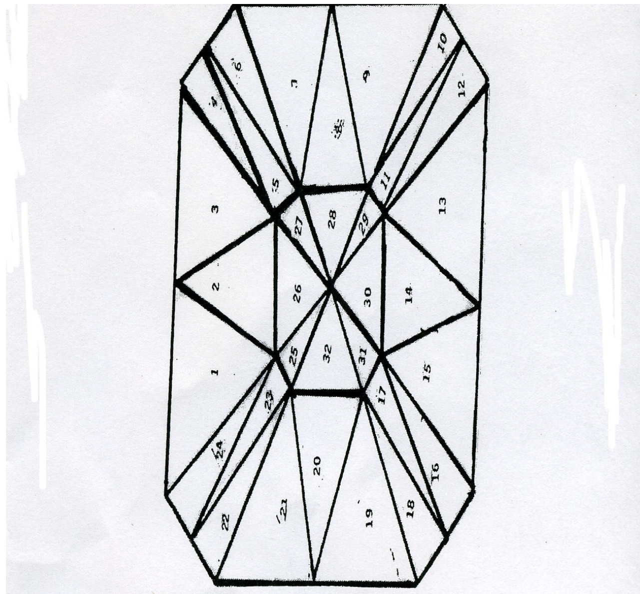


Figure 4. LDTS Protocol Geometric Asscher Cut Bottom Section Containing 32 Characteristics of Threshold Stabilization

LD STI =	LDT Objective Function	+ α[Csb -% Shoe Bomber]
		+ β[Ccsb - % Copycat Shoe Bomber]
		+ δ[Cdib - %Deeply Imbedded Boxes]
		+ ϕ [Clda - % of Laser Damage Airbourne]
		+ γ [Cldg - % of Laser damage ground]
		+ η[Csmf -% Shoulder Missile Firing Armament]
		+ ζ [bio - % Biological Agents In Containers]
		+μ [exp - % Explosives In Concrete Containers]
		+ λ[chem. - % Chemical Agents In Containers]
		+ κ[CIEDS - % Single Bombers]
		+ θ [CIEDD - % Double Bombers]

Figure 5. Lagrangian Deformable Tensor Intelligence(LDTI) Equation(5) containing the LDT Objective Function and the Correlated Terrorist Threat Lagrange Multipliers and Terrorist Threat Constraints Lagrangian Optimization Equation

∂ LDSTI / $\partial\alpha = 0$
∂ LDSTI / $\partial\beta = 0$
∂ LDSTI / $\partial\delta = 0$
∂ LDSTI / $\partial\phi = 0$
∂ LDSTI / $\partial\gamma = 0$
∂ LDSTI / $\partial\eta = 0$
∂ LDSTI / $\partial\zeta = 0$
∂ LDSTI / $\partial\mu = 0$
∂ LDSTI / $\partial\lambda = 0$
∂ LDSTI / $\partial\kappa = 0$
∂ LDSTI / $\partial\theta = 0$

Figure 6 LDTI Lagrangian Optimization Solution Terrorist Threat Lagrange Multiplier Partial Derivative Equations

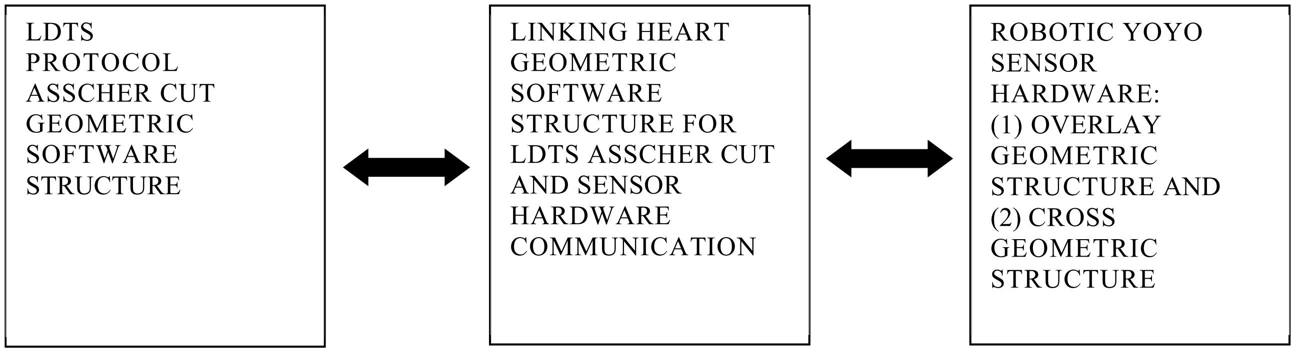
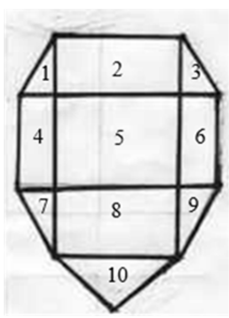


Figure 7. Robotic Bomb Disposal Three Geometric Software Structure Composition



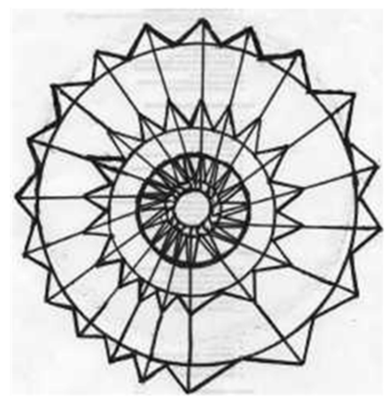


Figure 8A. Heart Geometric Software

Figure 8B. Overlay of Three Layers of Twenty Sensors in Each Layer

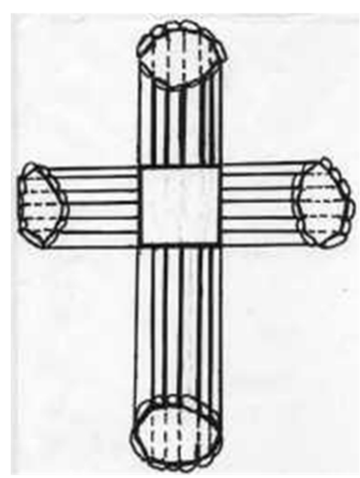


Figure 8C. Cross Structure of Twelve Sensor at end

Figure 8 The Combined Geometric Heart Structure Linking the LDTS Protocol Asscher Cut Geometric Software Structure and the Overlay Geometric Sensor Hardware Structure and the Cross Geometric Sensor Hardware Structure

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