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Intelligent and Optimal System for Monitoring Environmental Variables and Solar Luminosity, with solar path tracker and telemetry

A: J. Alan Calderón Ch.[1,2,3,*], ***B:*** Benjamín Barriga Gamarra[2], ***C:*** Julio C. Tafur Sotelo[2],
D: Fernando Jiménez Ugarte[2]

[1] Applied Nanophysics, Institute for Physics,
Technical University of Ilmenau, Ilmenau 98693, Germany.
Corresponding and the main author: *A:* *alan.calderon@pucp.edu.pe

[2] Control Engineering and Automation Master Program, Mechatronic Engineering Master Program, Energy laboratory, Engineering Department, Pontificia Universidad Católica del Perú, Perú.
[3] Aplicaciones Avanzadas en Sistema Mecatrónicos JACH S. A. C.
B: bbarrig@pucp.edu.pe, *C:* jtafur@pucp.edu.pe, *D:* ojimene@pucp.edu.pe

1. Problematic

In this proposed article is analyzed a general design of an intelligent system for the monitoring of physical variables of the environment conditions, as well as it is generalized a model to coordinate the dynamic of an automaton to follows the solar path in order to achieve solar light absorbance (from which also can be transformed to electrical energy), therefore, the automaton can use the stored electrical energy.

2. Proposed solutions

In this proposed research are analyzed general solutions and techniques to optimize the solar luminosity measurement by a designed smart system, as well as its usability by the solar energy conversion and its storing. However, many times, this kind of systems have not an optimal solar path tracker and as a consequence it can not be measured the full solar luminosity during all the day, therefore, in this work are designed optimal mathematical models and algorithms to enhance the solar path tracker according to measure solar luminosity and getting optimal solar energy conversion/storing, which is useful to study geographical conditions before to build solar energy conversion centers.

2. Proposed solutions, mathematical analysis

In the described context above, it was looked for an adaptive polynomial model based on modulating functions, thus the equation (1) gives information of the changeable response of a system in front an input signal "*u(t)*" on the time domain "t", the changeable response is given by "*y(t)*" but in simple response dynamic that can be considered as first order system, which also can be understood by its first derivative. Moreover, solving the equation (1) can be achieved the parameters "a_1", "a_2" and "b_1"

$$\frac{d^2y(t)}{dt^2} + a_1\frac{dy(t)}{dt} + a_2 y(t) = b_2 u(t) \qquad (1)$$

The following figure depicts the proposed system in which are quite necessary to find the coefficient parameters from the equation (1) to get the optimal response system

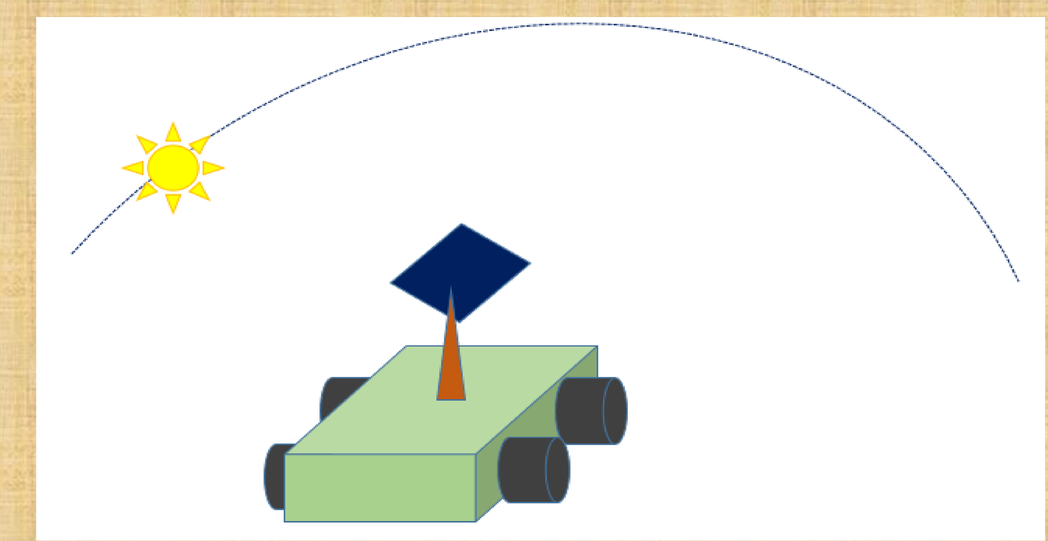

Figure 1. Scheme representation of the proposed system.

The parameters from the previous equations were obtained from the previous equation (1) by Modulating Functions analysis

$$\begin{pmatrix} -X_2\cos(V_2) & X_3\cos(V_3) \\ -X_2\sin(V_2) & X_3\sin(V_3) \end{pmatrix} \begin{pmatrix} a_1 \\ a_2 \end{pmatrix} = \begin{pmatrix} E_{Re} + b_2X_4\cos(V_4) - X_1\cos(V_1) \\ E_{Img} + b_2X_4\sin(V_4) - X_1\sin(V_1) \end{pmatrix} \qquad (2)$$

Then, the general model for the electromagnetic wave equation, which has the information from the sensors of the path tracker can be reduced by the equation (3)

$$y(t) = A\sin\left(2\pi\frac{\left(\frac{c_0}{1+2\frac{GM}{rC^2}}\right)}{\lambda}\, t \pm \alpha\right) \qquad (3)$$

It means the equation (4), which also tends to the classic equation (41) because of the path tacker speed is quite less than "c". However, also this model can help for interplanetary tasks that could use a model as I t is proposed in this research, because of the searching of optimal places where to fix and use solar panels.

$$y(t) = A\,sin\left(2\pi\frac{f_0}{1+\left(\frac{v}{c}\right)^2}\, t \pm \alpha\right) \qquad (4)$$

3. Results

After to analyse every equation to describe the correlation between the transducer data (sun radiation absorbance, temperature, pressure and humidity) with the path tracker dynamic, it was designed the algorithm to be executed for the evaluation of the performance of the designed system by the simulations and experiments.

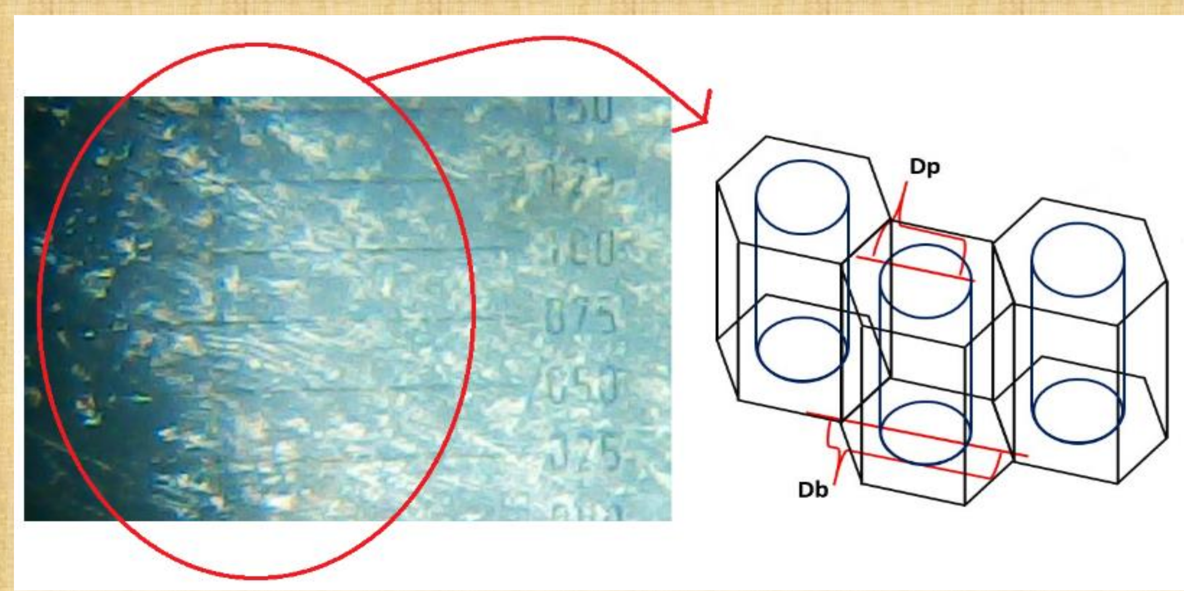

Figure 2: Transducer samples design

The figure 3 shows the electrical energy absorbed (W/m^2) by the solar panel designed for the path tracker during operation (data quantity per second), based on the execution of the main algorithm selection of the path tracker in order to find an optimal suggestion to the user where to fix and use solar panels.

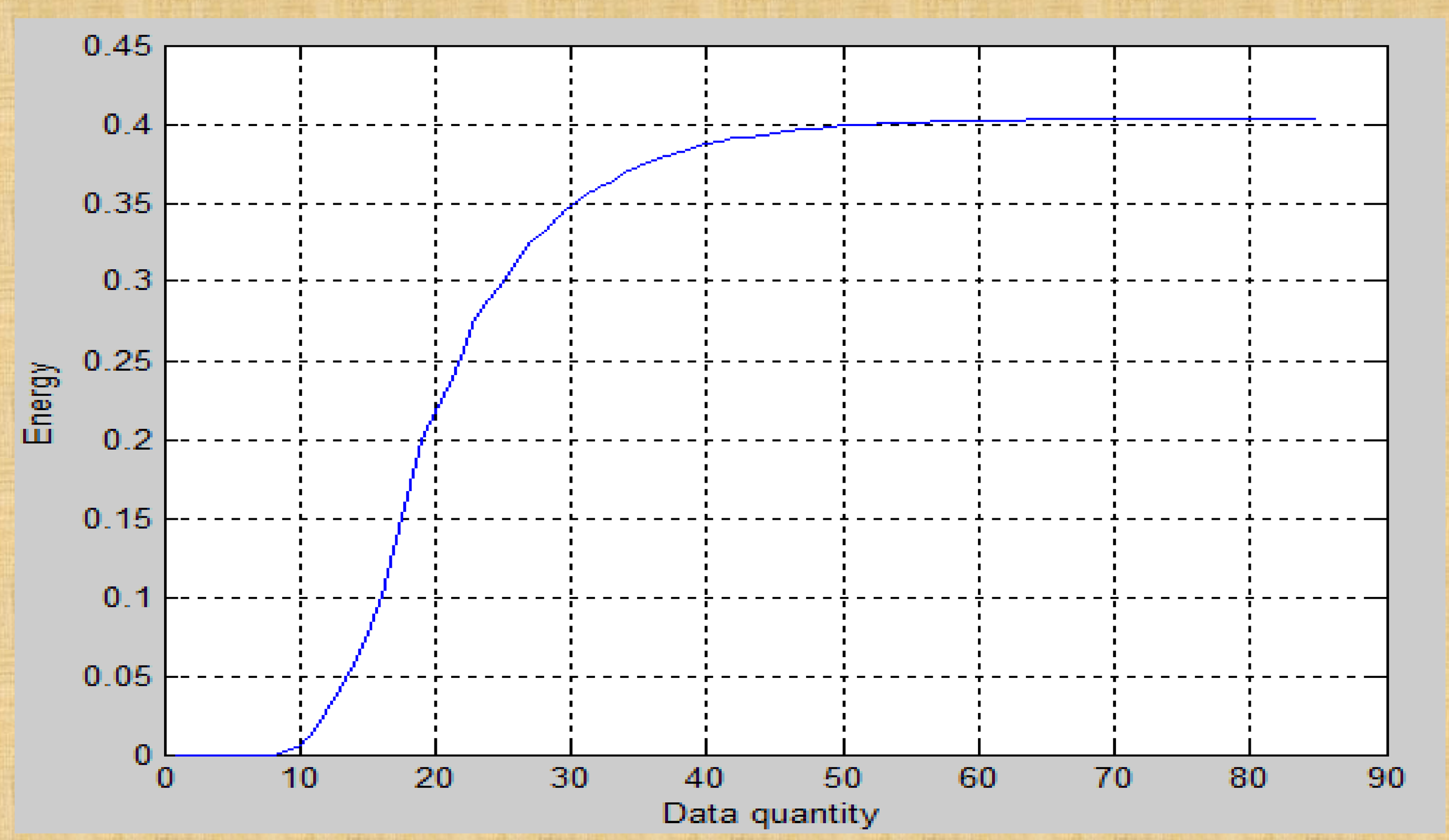

Figure 3: Dynamic response of the energy absorbed by the designed path tracker.

4. Conclussions

It was designed a general polynomial model according to correlate the transduction effect of sun radiation by transducers based on nanostructures, with the dynamic of a solar path tracker. Therefore, the analytical solutions through Modulating Functions by adaptive criterion were good strategies to design a sophisticated algorithm, which also was used by the simulations and experiments to evaluate the performance of the proposed designed system.

As well as, also it was analyzed the telemetric effect among the transduction (sun radiation and environment variables), the path tracker dynamic and the telemetry (data communication from the path tracker with the external user). Furthermore, it was analyzed the consequence of the proposed system under relativity theory that could be a support for interplanetary communications, such as for example to deal with the trouble of the delay reduction from the data communication between our planet and mars.

Hence, the proposed research can be a support to improve the uses of sun panels, because of the designed solar path tracker can give information regarding optimal places to store solar panels, which can be used to develop optimal tasks, such as for example pumping water, which is taken from lakes to far communities based on the energy conversion from solar panels to the pump.

5. Aknoledgements

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