**PHOTO VOLTAIC (PV) SOLAR PANEL MODELLING**

ENGN 8120 Systems Modelling

***Submitted by***

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1. Variable Selection

The most preferred choices of variables are the irradiance (G), temperature (T), photocurrent (Iph), reverse saturation current (Irs), open circuit voltage (Voc), short circuit current (Isc). The choices remain obvious, as these are the basic parameter are to be considered when designing any electrical based system. The generation of power primarily depends on irradiance and temperature. The photocurrent is the current generated in a cell, short circuit current / open circuit voltage is determined to ensure the rating of protective circuits for the PV model.

1. Model Development

The solar photovoltaic model is developed based on the following equations,

A single photovoltaic cell generates 0.6 V and a module contains 36 such cells connected in series to generate 21.6 V. In layman terms, the tilt angle of the photovoltaics is the latitude of the location where the panel is installed. This note can be elaborated as, Latitude angle + 15 (winter tilt) / Latitude angle – 15 (summer tilt). Other way to calculate tilt angle would be (latitude angle \* 0.9) + 29 (winter tilt), this steeper tilt enables the panels to tap into more energy during the midday of short winter days. (Latitude angle \*0.9) -23.5 (summer tilt) and latitude angle -2.5 (spring/ autumn tilts), these angles are highly helpful when the panels are mounted to a stand/ post rather than roof of the building. All the solar panels must be north facing in Australia to tap highest amount of energy. The tilt angle matters in the power generation because the irradiance/ insolation depends the incident angle of the light energy from the source.

The above equation gives the amount of energy in Whm-2 on the horizontal earth surface at a latitude.

The H0h equation gives the energy that incidents on earth on any day in 1m2, from which the irradiance can be calculated and fed into the model including temperature, to get the graph of maximum power generated on any given day.

1. **Instantaneous power generation on equinox in Canberra**

Fig 1 PV graph on equinox

1. Design of Convolutional Neural Network to perform semantic segmentation
2. Testing and improvements
3. Results and outcomes
4. References