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# SHORT TERM SOLAR IRRADIANCE PREDICTION MODEL USING GROUND BASED SKY IMAGING

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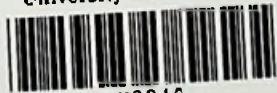
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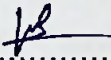
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## DECLARATION

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## ABSTRACT

With the growing energy demands and depleting fossil fuel deposits world is moving towards renewable energy. Solar energy has become a focus on this transition, especially in tropical countries where solar power harvesting is economical. The major disadvantage of solar power is its intermittent behavior due to cloud movement. Several researches are ongoing to predict the solar power in different temporal and spatial resolutions as a solution to this drawback.

This research discusses on a short term solar prediction model using total sky images captured with a specifically developed hardware. A MATLAB software model is developed using image processing techniques to track and predict cloud movement throughout the visible span. The cloud movement behavior is mapped with the output current of a fixed solar panel to develop the prediction algorithm. The developed software model is capable of predicting the solar panel output on real time total sky images with a 10 second temporal resolution. Additionally, the model parameters can be fine-tuned to predict the solar irradiance for a different location.

*Key words: solar prediction, image processing, renewable energy, solar power, MATLAB*

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## LIST OF ABBREVIATIONS

<b>Abbreviation</b>	<b>Description</b>
ANFIS	Adaptive Neuro-Fuzzy Inference System
ANN	Artificial Neural Network
AR	Auto Regressive
ARIMA	Auto Regressive Integrated Moving Average
ARMA	Auto Regressive Moving Average
CEB	Ceylon Electricity Board
FL	Fuzzy Logic
GHI	Global Horizontal Irradiation
IPP	Independent Power Producer
MOS	Model Output Static
NDFD	National Digital Forecast Database
NREL	National Renewable Energy Laboratory
NWP	Numerical Weather Prediction
PV	Photo Voltaic
RGB	Red Green Blue
RMSE	Root Mean Square Error
SLSEA	Sri Lanka Sustainable Energy Authority
SPA	Solar Position Algorithm
TDNN	Time Delay Neural Network
TSI	Total Sky Imager
USB	Universal Serial Bus
UTC	Universal Time Coordinated
YES	Yankee Environmental Systems