بسم الله الرحمن الرحيم

(وَآيَةٌ لَهُمُ اللَّيْلُ نَسْلَخُ مِنْهُ النَّهَارَ فَإِذَا هُمْ
مُظْلِمُونَ(37)وَالشَّمْسُ تَجْرِي لِمُسْتَقَرٍّ لَهَا ذَٰلِكَ تَقْدِيرُ
الْعَزِيزِ الْعَلِيمِ(38) وَالْقَمَرَ قَدَّرْنَاهُ مَنَازِلَ حَتَّىٰ عَادَ
كَالْعُرْجُونِ الْقَدِيمِ (39) لَا الشَّمْسُ يَنبَغِي لَهَا أَنْ تُدْرِكَ
الْقَمَرَ وَلَا اللَّيْلُ سَابِقُ النَّهَارِ وَكُلٌّ فِي فَلَكٍ يَسْبَحُونَ
(40))

صدق الله العظيم . سورة يس الآية ٣٧-٤٠ الآية

Dedication

To our Parents

To our Department

To our Friends

And others

Acknowledgement

We are very thankful to all who contributed in this work, our best thanks to our teacher DR. Osman Mohammed Osman who was very generous in assisting us with the best advices.

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Abstract

A PV voltage regulator for solar application is proposed to boost and regulate the voltage to charge an aircraft 12V/0.43A battery. The proposed regulator is designed using a boost converter and PWM controlled by a PI controller.

The designed system is modelled and simulated using MATLAB and PLECS software programmes, and the results prove that the proposed system for the solar regulator is working as it expected.

التجريــــــــــــد

تم تصميم منظم لفولتية الخلية الضوئية لتطبيقات الطاقة الشمسية يقوم بتدعيم وتنظيم الفولتية وذلك لشحن بطارية طائرة ١٢ فولت / ٠,٤٣ امبير. صمم المنظم باستخدام محول مدعم للفولتية ومولد نبضات (PWM) ومتحكم تكامل نسبي (PI Controller).

تمت محاكاة نموزج للنظام المصمم باستخدام برنامج (MATLAB) وبرنامج (PLECS) والنتائج المستخلصة اثبتت أن النظام المصمم يعمل كما هو متوقع.

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Symbols	Description
I_{mpp}	Maximum power point current
V_{mpp}	Maximum power point voltage
I_{ph}	Photovoltaic current
$I_{ph,n}$	Light-generated current at nominal condition
K_i	Current temperature co-efficient
G	Actual sun irradiation
G_n	Nominal sun irradiation
ΔT	Difference between actual temperature and nominal temperature
I_0	Diode saturation current
$R_{se} \& R_{pa}$	Due to the presence of internal resistances
a	Diode idealistic factor
V_t	Junction thermal voltage
K	Boltzmann constant = 1.3806503 × J/K
Q	Electron charge = 1.607 C
D	Duty Ratio
T	Switching time
I_l	Inductor current
f_s	Switching frequency of the boost
ΔI_l	Estimated inductor ripple current
C_{min}	Minimum output capacitance
I_{out}	Output current
I_{max}	Maximum current
I_{min}	Minimum current
V_s	Input voltage
V_l	Inductor voltage
V_0	Output voltage
I_D	Diode current
R	Resistance
C	Capacitor
L	Inductor
V	Voltage
A	Ampere
H	Hennery

H_z	**Hertz**
w	**Watt**
m	**Meter**
$K_p \& K_i$	**The tuning knobs**
µ	$\mathbf{10^{-6}}$
Δ	**Delta**
M	$\mathbf{10^{-3}}$
K	**Kelvin**
Ω	**Ohm**
S	**Second**
J	**Joule**

Abbreviations

Abbreviation	Description
PV	**Photovoltaic**
MPP	**Maximum power point**
Max	**Maximum**
Min	**Minimum**
DC	**Direct current**
ESR	**Equivalent series resistance**
PI	**Proportional integral**
PWM	**Pulse width modulation**
MATLAB	**Matrix laboratory**
PLECS	**Piecewise Linear Electrical Circuit Simulation**