Development of a maximum power point tracking system for solar lighting applications

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In the power sector of Sri Lanka, 65% of the required energy is generated by using Fuel sources. Since all necessary fuel to generate electricity is imported from other countries, the unit cost of generating electricity is very high. Renewable sources such as solar power and small scale hydro power have emerged as an economical and sustainable alternative source to promote medium term electricity generation especially to rural communities. Since Sri Lanka is situated close to the Equator, solar radiation over the island does not show high seasonal variability. The average solar radiation remains at 5.0 kilo Watt-hour/square meter/day, and thus, substantial potential exists for harvesting renewable solar energy.

In this work, a smart charge controller was developed and tested for Solar lighting applications. The smart charge controller is mainly designed for a battery charging application which is controlled through a low cost, low power consumption PIC16F877A microcontroller. The charging current is used to change the duty cycle of the dc/dc converter control signal. The smart charge controller uses the Maximum Power Point Tracking (MPPT) technique to obtain the optimum results. The results show that the MPPT process increases the charging current. The measurements show that percentage increase in charging current compared to the 12.5 V regulations is above 100% even under cloudy conditions.

Spectral characteristics of traffic noise attenuation by vegetation belts

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Traffic noise level measurements were carried out at 38 selected sites in the vicinity of main traffic routes to determine the effect of roadside vegetation belts on the reduction of road traffic noise levels at different frequencies. Naturally growing roadside vegetations which have the potential to act as noise absorbers were selected for this study. Several noise level descriptors were recorded together with the A-weighted continuous noise level. The results show that in general, noise attenuation increases with the frequency due to roadside vegetation belts. Higher frequency noise (above 4 kHz) is heavily attenuated by the vegetation with virtually no attenuation for low frequency noise (below 100 Hz). On average, vegetation belts were able to reduce the noise by 4 dB(A) which corresponds to approximately 58% acoustic energy reduction. In some cases, due to the thick growth of the vegetation, up to 9 dB(A) which corresponds to 87% acoustic energy reduction was observed. Thus, vegetation belts could be used as environment friendly effective barriers to control traffic noise at crucial sites.