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(57) Abstract :
 The growing demand for efficient energy consumption and monitoring has led to the development of intelligent energy management systems. This work presents an Arduino-based Smart Energy Monitoring System that enables real-time monitoring, analysis, and control of daily and monthly power usage through a mobile application developed using MIT App Inventor. The other feature of the software allows the users to control appliances and monitor their energy usage from anywhere around the clock while giving real-time data on daily and monthly consumption trends to manage appliances using a 2-channel relay module, these relevant to remote facilities. The scheduling of appliances by users helps in the efficient utilization of energy. Accuracy tests show that the voltage measurement error will be at most 1.5% and the current measurement error will not be more than 2%. Further, the energy application integrates well with average loading times of 3.8 seconds for data access and 4.5 seconds for appliance control. Future enhancements would include solar power availability, usage of machine learning techniques for predictive analysis, and the establishment of long-term storage of data.

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