

**ELECTRICAL AUTOMATION  
SYSTEMS TOWARDS INTELLIGENT  
AND ENERGY EFFICIENCY  
APPLICATIONS**

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Musse Mohamud Ahmed



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**APPLICATIONS**

**Musse Mohamud Ahmed**

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## CHAPTER 19

### MODELING OF AN ENVIRONMENT FRIENDLY HYBRID ELECTRIC VEHICLE (HEV)

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#### 19.1 Introduction

The automobile industry continues to grow by leaps and bounds, and due to the increase in the number of vehicle worldwide, air-pollution continues to increase. Though the automobile manufacturers have reduced the greenhouse gases such as hydro-carbons, carbon monoxide, carbon dioxide, etc., from the vehicle, they cannot produce a zero-emission vehicle unless they produce an electric vehicle (EV). An electric vehicle is an emission free, environmental friendly vehicle. However, the electric vehicles remain unpopular among the consumers due to their lack of performance and their inability to travel long distances without being recharged. So, vehicle that embraces both the performance characteristics of the conventional automobile and the zero-emission characteristics of the electric vehicles are greatly being anticipated by the general consumers and the environmentalists alike. When emission regulations tightened in the last quarter of the 20th century and engineers made breakthroughs in hybrid and electric vehicle technology, automobile manufacturers began to look more seriously into vehicles with alternative power sources. These lead manufacturers to come up with a vehicle that is acceptable by the consumers and also meets the performance of the conventional vehicle with much less emissions. Such vehicles are branded as Hybrid Electric Vehicle (HEV), the name being derived from their ability to run in either gasoline mode or electric mode or both. The electric motor in the hybrid electric vehicle assists the gasoline engine during acceleration and receives its power from a dedicated battery pack. The beauty of the HEV is that energy can be fed back into the battery for storage, e.g., during regenerative braking (which is otherwise wasted as heat in a conventional vehicle). Leading car manufacturers like Toyota and Honda have already started mass producing HEV cars, Prius and Insight respectively, which are now becoming very popular among the consumers for their incredible mileage and less emissions. Aside from that, a number of automotive manufacturers are marketing hybrid vehicles for the general population, examples are DaimlerChrysler, Mitsubishi, Nissan, Fiat, Renault, Ford, GM, and Subaru [1]. Although the number for alternative electric vehicles is not significantly higher when efficiency is