Diverse Terrain Wheelchair

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The project aims to help the mobility challenged move comfortably and unassisted and thus regain their confidence. This diverse terrain vehicle kept the needs of the Vietnamese in mind and solved the weaknesses of other climbing wheelchairs. It was created to maintain a low vibration, to be affordable (760 USD), to have ease of control, and to climb up stairs (maximum rise height of 25cm and elevation of 35°) while the user faces forward, reducing fear and reliance on other people or equipment. The vehicle's prime innovation was its dynamic balancing system which adjusted the vector of mass center while ascending a slope or stairs, preventing the moment force from pulling the vehicle down. Moreover, the application of the track and suspension system into the vehicle enabled it to travel on rough roads, including stairs, with low vibration. SolidWorks, a 3D drawing software, was selected for the design process. After improving through 8 versions with continuous research, calculation, trial and error, the most optimized design was completed. Studies of motion analysis via SolidWorks showed that the wheelchair could keep balance on stairs. Simulation analysis via SolidWorks of the pressure on and resulted displacement of the frame showed that the vehicle can transport a person of 100 kg. A half-sized model and two life-sized prototypes were completed with technical help from a workshop. Experiments on these products confirmed that the dynamic balancing system ran as desired with the actuator's velocity of 3 mm/s. The prototypes could move forward, backward, turn left, and right. The track system can independently travel on diverse terrains such as rocky roads, potholes, sand, mud, slopes, and stairs. Problems of limited mobility and user impact were assessed and solved.

Awards Won:
Third Award of $1,000