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Energy Efficient Walking Mechanism with Genetic Algorithm Synthesis

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This research covers the use of legs for transportation rather than wheels. Legged walking is potentially more efficient than wheels on deformable surfaces such as sand, where the required transportation energy is related to the amount of sand displaced. Available robotic walking devices use multiple motors per leg to control movement, which allows multiple degrees of freedom, but consumes excessive energy. Because the center of mass remains at a constant elevation, this new mechanism consumes no energy except for joint and sliding friction of the legs while traveling on level ground. Previously, no available mechanisms were efficient enough for a personal transport device based on size, weight, and energy consumption. Because no mechanism-synthesis programs were readily available to allow optimization of these criteria, a genetic algorithm was designed and written. The resulting mechanism appears to be superior to any previous designs, and will be tested with a full scale prototype.

Robert Adams is a dual major student in mechanical engineering and biological sciences, and is currently finishing up his junior year. He is very involved with his department and serves in leadership roles in the American Society of Mechanical Engineers as well as in Pi Tau Sigma, the mechanical engineering honors society. Beyond the department, Robert leads the mechanical group of the Robotics Competition Team, and is involved with Scrubs, the university pre-medical group. After Missouri S&T, he plans to work in the field of orthopedic prosthetics.