Lever Propelled Wheelchair

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***Abstract*—Over 60 million people living in the developing world need a wheelchair. With little income and non-accommodating living conditions, western-style wheelchairs are unobtainable. Disabled developing world inhabitants need a reliable wheelchair that is both inexpensive and physiologically efficient.**

I. Introduction

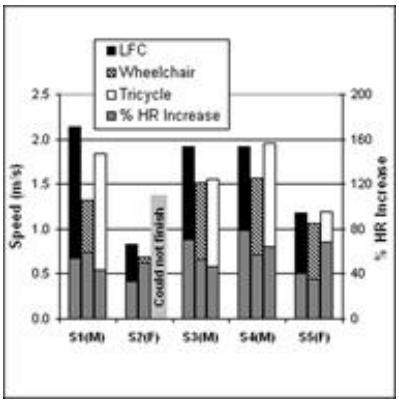
There are millions of people around the world living with spinal cord injuries. Depending on the severity of the injury, a conventional self-propulsion wheelchair is the most commonly used medical assistive device in use today. The conventional push rim design is perfect for the insured handicapped accessible America, where most sidewalks have ramps and almost all commercial building have elevators. If a disabled person needs to travel far distances, they can take a handicapped accessible bus, taxi, or car. This is not the case in developing nations: the income is low, the terrain is rough, and mechanical knowledge is limited. The perfect wheelchair for a developing nation would be inexpensive, highly efficient, and easy to maintain.

II. Methods

There have been all terrain wheelchairs and hand-powered tricycles for a few decades. The only problem, however, is the cost. They can cost upwards of four-thousand and five-hundred dollars. This is not something that a dollar per day kind of person can manage. A good way to lower the price is to have the product made locally, using material that is readily available. The best direction to move, based on this idea, is to create a wheelchair using the same materials that are used to create a standard bicycle. In developing nations where cars are rare, bicycles thrive to the point where there are bicycle mechanics all over. Bicycle parts are so cheap that maintenance of the wheelchair will cost very little to the user. So it only makes sense to model the lever propelled wheelchair from a standard bike. The wheelchair consists of a frame, two free wheels, a front wheel, two chain rings, two chains, two chains, the levers, and the rear bike hubs with water pipe.

III. Results

When compared to a conventional wheelchair offered in developing countries, the leveraged wheel chair gave much better results. It was about 75% faster on an average commute, and had about 50% more torque with around 40% more efficiency than the standard wheelchair. While hand-powered tricycles deal with all-terrain surfaces much better, they are far too large for everyday purposes. Disabled users were able to go the same distance as with their regular chair, with less effort in a fraction of the time. The Leveraged Freedom Chair®(engineered through MIT) costs about $150 and went into production in India through Pinnacle Industries in the summer of 2012.



IV. Discussion

The lever propelled wheelchair exemplifies how Biomedical Engineers can help make social change through innovation. By partnering with companies and organizations all over the world, Global Research Innovation & Technology (GRIT) has been able to give thousands of Leveraged Freedom Chairs® to people all over the world. As seen through this innovative technology, Biomedical Engineers do not have to make a biologically integrated piece of technology to make a difference. Something as simple as a lever propelled wheelchair can make a vast impact on one's quality of life.

References

[1] URI BME 281 BME Seminar II <www.ele.uri.edu/courses/bme281>.
[2] Ahmad Rifai Sarraj, Ahmad R., and Raphael Massarelli. "Design History and Advantages of a New Lever-Propelled Wheelchair Prototype." Intechopen.com. 13 May 2013. 15 Oct. 2013
[3] "Leveraged Freedom Chair (LFC) / India." *D-Lab*. Massachusetts Institute of Technology, n.d. Web. 17 Oct. 2013. Blake G, Bly RW. *The elements of technical writing*. Longman, 1993.
[4] Winter, A., et al. (2010). LEVERAGED FREEDOM CHAIR: A Wheelchair Designed for Developing Countries. In *Rehabilitation: Mobility, Exercise and Sports: 4th International State-of-the-Art Congress* (Vol. 26, p. 54). IOS Press, Incorporated.

[5] Van der Woude, et al. (1993). Physiological evaluation of a newly designed lever mechanism for wheelchairs. *Journal of medical engineering & technology*, *17*(6), 232-240.
[6] NuDrive Lever Wheelchair < http://www.nu-drive.com/medical/>