ELECTIVE IN ROBOTICS 2012/13
Short project in Module "Locomotion and Haptic Interfaces"

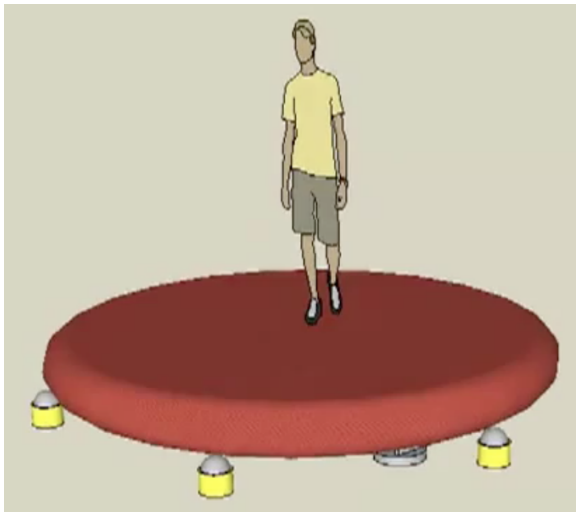
A new omnidirectional treadmill (Virtual Reality Floor): Modeling and control of the device

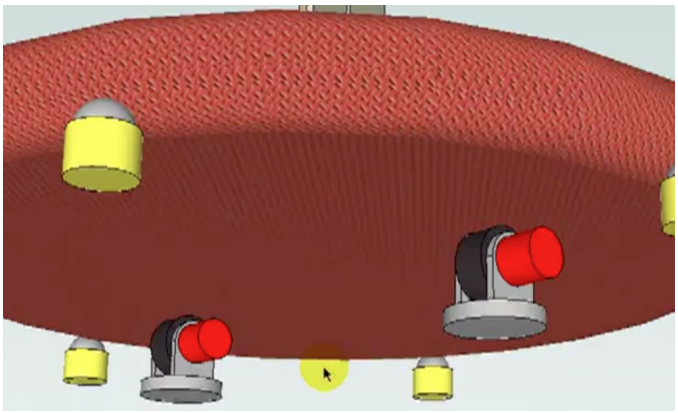
A new locomotion interface has been proposed on YouTube, see

http://www.youtube.com/watch?v=lZ9HrK_wDLA&feature=channel&list=UL

and its update

http://www.youtube.com/watch?annotation_id=annotation_401015&feature=iv&src_vid=lZ9HrK_wDLA&v=q97QxnLlDcI





In the latest proposed sketch, two rolling and steering (i.e, that can be reoriented) wheels are placed at the bottom of the platform, in contact with the carpet floor that covers completely the inner structure of the platform, so as to roll/displace the floor and thus the human user walking on top of it. Try to model the kinematic behavior of the platform, and the resulting human displacements. Some implicit assumptions are needed, e.g., the friction at the contact between the wheels and the carpet is sufficiently large to avoid any slippage and the carpet floor itself can slide without any friction over the supporting inner structure. Apparently, some coordination of the commands $(v,\omega)_{left}$ and $(v,\omega)_{right}$ of the two wheels (i.e., a total of four linear/angular velocity commands) is also needed.

If the proposed design makes sense, perform some simulations to show the effect of feasible actuation commands on the human position/orientation (while the user is standing still). Missing dimensions can be chosen at will. Try then to design a control law that keeps the walking user at the center of the platform.

No supporting material is available (this is a rather open-ended project).

ADL, November 23, 2012