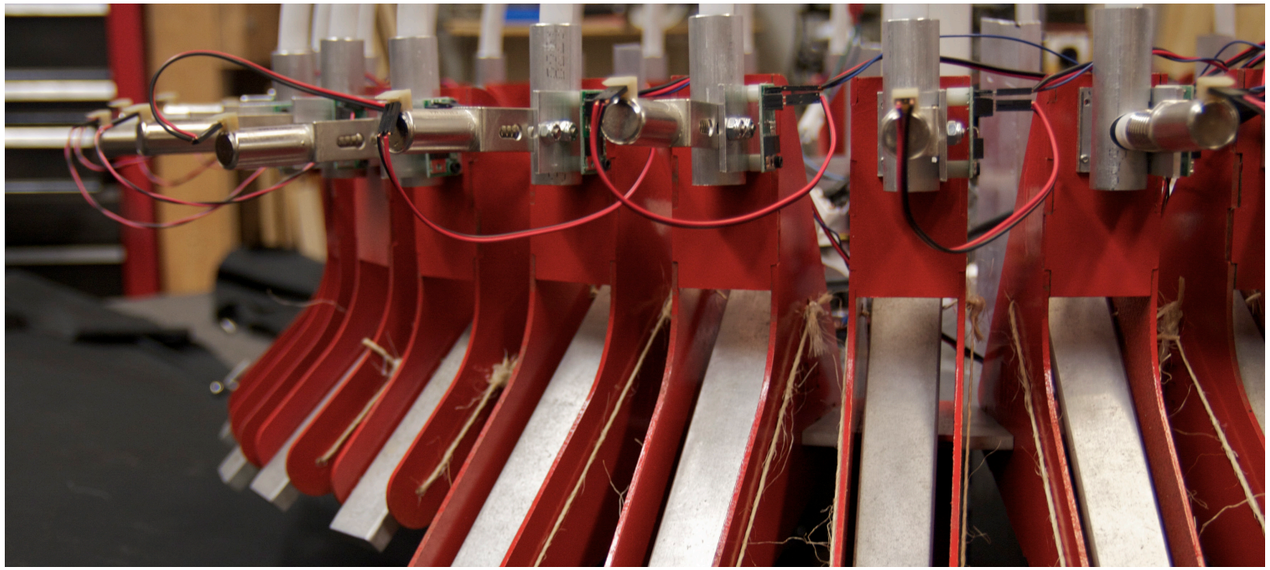
MIKE ORNSTEIN

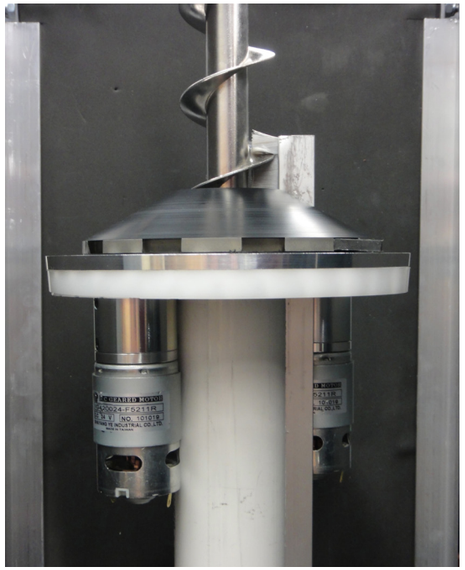
robots and stuff

Vibratron

An electronically controlled vibrophone played by 6000 ball bearings falling in harmony.



vibratron keys there are 30 keys on vibratron, each played by dropping ball bearings



archemede's distribution center mechanism utilizing auger and motors to recirculate ball bearings

distribution gears gears are made from stock and waterjet parts. the 30 holes allow balls to travel to each of the keys

Vibratron is one of the main RobOrchestra projects for the 2010-2011 year. After receiving $1000 in grant money from the Undergraduate Research Office in the form of a SURG and a donated vibraphone from a former member, the team began designing a robotic Vibraphone.

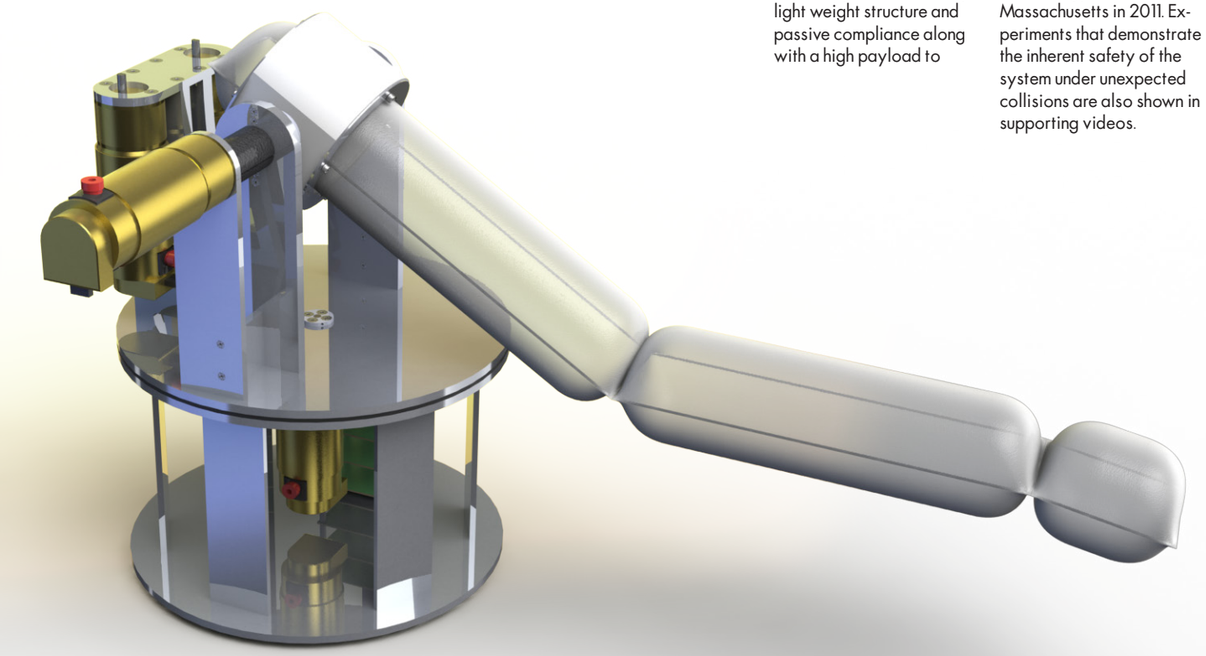
The overall vision for the project involves laying out the 30 vibraphone keys in a circular array and dropping steel ball bearings onto the keys in order to create music. While other more direct methods might have been more effective, the group opted to create a more unique piece of art.

The robot is complete and on display in the Robotics Club at Carnegie Mellon University. The bot is composed of three main systems. One of the systems dispenses the balls onto the keys, one collects the used balls and recycle them to be used again on a different note, and the third system is the structure of the robot that hold the keys and all other systems together. Vibratron can play many songs in MIDI file format.

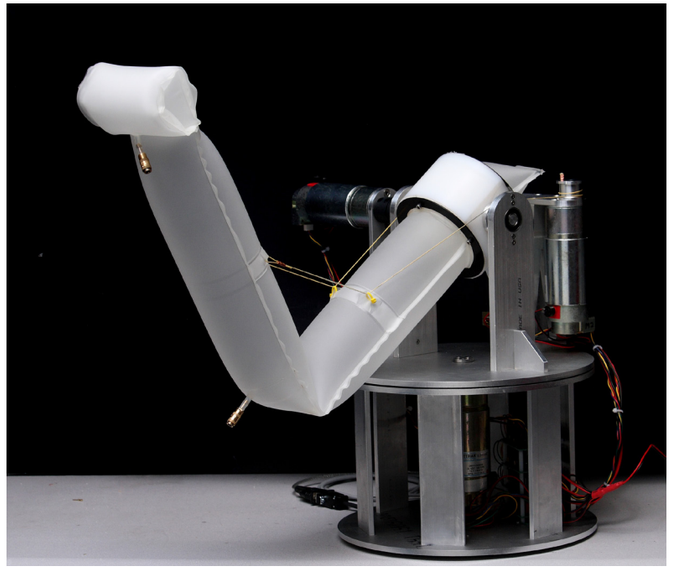
Soft Robots

Robots constructed with safe, close human interaction in mind

There is a growing need for robots that can function in close proximity to human beings and also physically interact with them safely. This calls for a paradigm shift in the way robots are designed. We believe inherent safety is extremely important for robots in human environments. Towards this end, we propose the use of inflatable robot links instead of traditional rigid links, to improve safety in physical human robot interaction. Robots with inflatable structural components offer the possibility of an extremely light weight structure and passive compliance along with a high payload to weight ratio, which are all highly desirable features in a robot expected to closely interact with humans. This research builds upon prior work by the Humanoids Lab in the Robotics Institute at Carnegie Mellon University in the development of a single link inflatable robotic system to design and develop a multiple DoF inflatable arm. Preliminary trials utilizing the system for sponge bathing a human mannequin have been presented at the Consumer Electronics Show in Las Vegas, Nevada in 2011 and additionally at the Engineering in Medicine and Biology in Boston, Massachusetts in 2011. Experiments that demonstrate the inherent safety of the system under unexpected collisions are also shown in supporting videos.



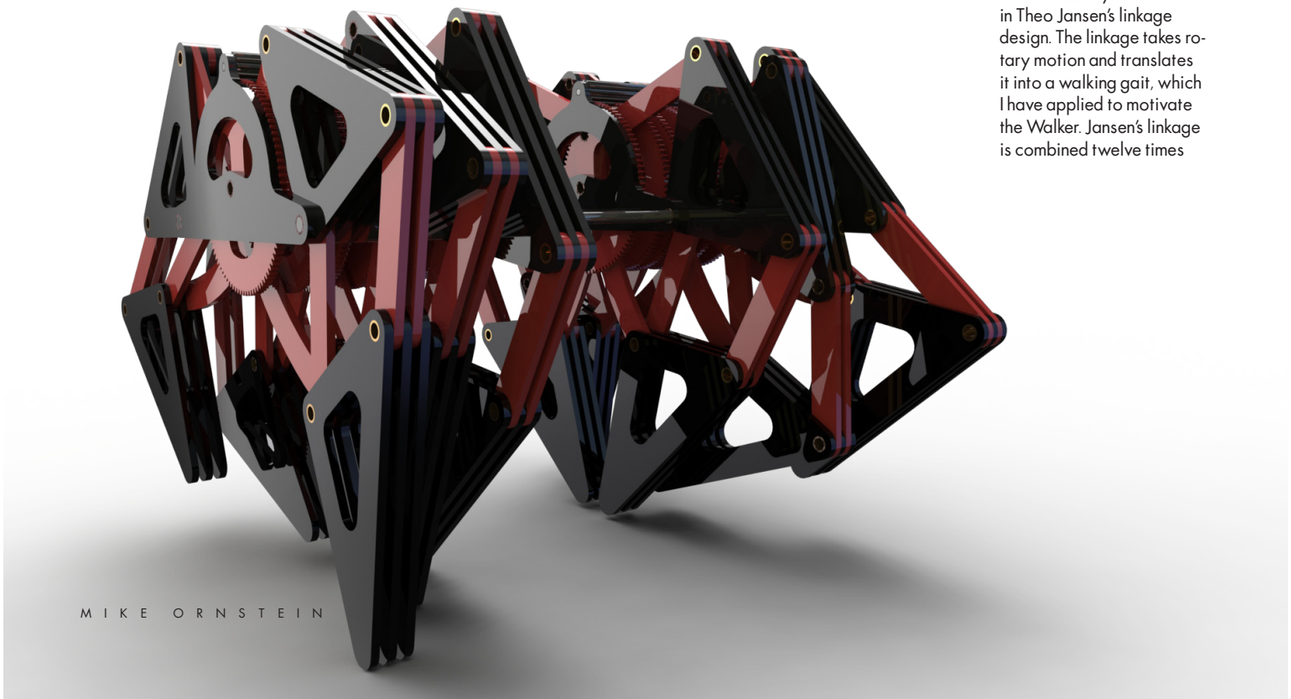
Consumer Electronics Show 2011 the robot equipped with a face wiping towel and companion mannequin was exhibited at the 2011 CES in Las Vegas



inflatable robot arm prototype a physical manifestation of a soft robot: the robot has two degrees of freedom at the sholder and two at the elbow

RedWalker

Designer statement and a supportive walking creature; based on Theo Jansen's Strand Beests.



MIKE ORNSTEIN

Using a computer as a conceptualization tool is invaluable for me in solving engineering and design problems. It is also a tool of creative expression. Computers have enabled me to recwreate a design of Theo Jansen's walking linkage in a new, digitally expandable form. I have kept the design as open and plain as possible given its complex mechanical nature, while being mindful of the placement of each component to ensure an aesthetically pleasing arrangement. Because of this, the concept is unusually organic for a mechanical creation and its walking capabilities are inspired by nature's solutions.

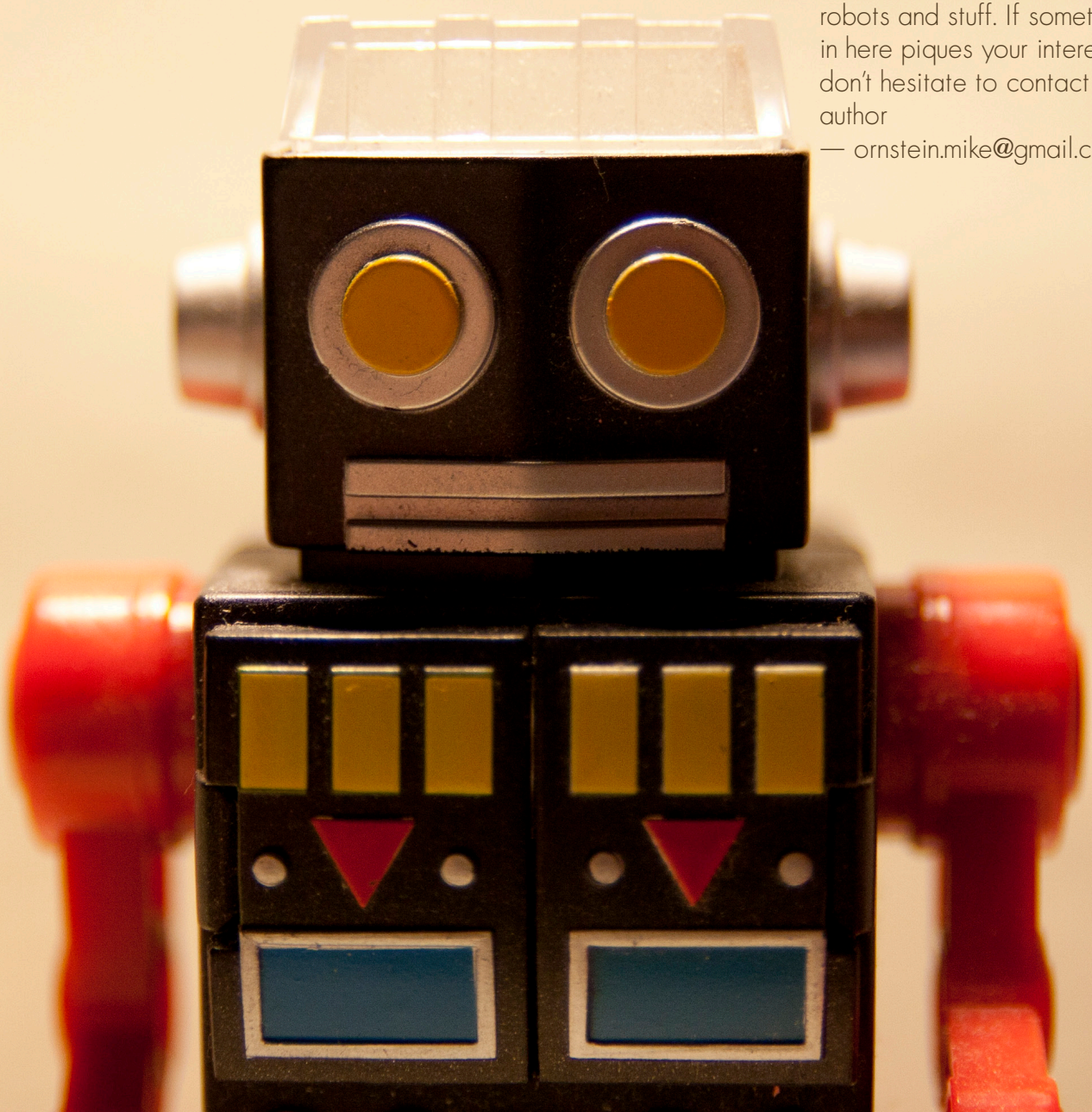
The Walker concept is a creature that stands as high as dreams allow. In the assosciated image, the creature is only eight inches tall, but by design can be grown to over eight feet tall. This scalability is inherent in Theo Jansen's linkage design. The linkage takes rotary motion and translates it into a walking gait, which I have applied to motivate the Walker. Jansen's linkage is combined twelve times to create a beast that can walk in all directions. There are two distinct leg groups that comprise the left and right side, each with six legs. The left and right leg groups are independently driven, though the six legs that make up each group are linked together, 60º out of phase. This link is created through meshing gears. In practice, each of the leg groups will act as a wheel, having constant contact with the ground and ensuring stability as the Walker travels. When both leg groups are driven together at the same speed, the Walker travels in a straight line. However, when the leg groups are driven at different speeds, the Walker will turn towards the slower (or stopped) group of legs. These legs, a pair of motors, and a power source are the only components of the machine. This system can be realized as any tangible object ranging from a toy, to a transportation vehicle, to an extraterrestrial exploratory robot, or, as Jansen would have it, to a new form of life. The bare components are uncovered and unadorned, allowing onlookers to see exactly how the machine is working. The internal components make up the Walker's lines and character, proudly striding without a shell or case. Mechanical design can always be beautiful.

My motivation as a designer stems from objects that hold promise for beautiful and tangible creation, but whose design is executed in an unsatisfactory manor. I am annoyed with art, sculpture, and toys that are meant to appear functional, but are limited or immutable. These objects just don't work the way you want. There are exceptions to my issue with falsity- for example, in fantasy. Digital animation that visualizes the currently impossible is an amazing treat. Visuals such as those present in recent science fiction films like Transformers and Iron Man can't be physically manufactured today, but the concepts are almost realizable. The audience of these films can accept that details are in place so that the mechanical devices in action on screen could exist in the real world eventually. There are many gaps in detail that we are currently filling with 'Hollywood Magic,' which is appropriate for movies, but not for today's objects. In some cases design is moving in the more open, understandable direction. The ElectroLux vacuum cleaner of the 1930's sought to hide its workings, enclosing the magic, but the Dyson vacuums of today fall within my principles by making its workings visible and clean.

Design of an object should not only follow the function of an object, but also how that object accomplishes that function. Often, a designer detaches their work from the means by which a task is completed. Dogs, for example, walk effortlessly, without regard to which muscle to tense at any given point to propel themselves forward. To many designers, making a walking creature involves merely attaching legs, allowing the underlying mechanism to work itself out. It is easy for design to abstract these types of problems, it takes effort to make an object work, and in the minds of many, effort to make the object appeal. My principle of design is that an object that works is appealing, be it conceptually, visually or physically.

Like Jansen, I believe that the aesthetics of an object come about due to natural application constraints. The form of his 'beests' came to be out of necessity. The proportions of the mechanism that I have borrowed from Jansen in the concept make for a visually pleasing object, perhaps only by coincidence. By following natural solutions to engineering problems, beautifying and ornamenting objects becomes superfluous. Jansen frees himself and his work of excess, focusing on efficiency and self-sustainability, brought about by deterministic solutions.

Theo Jansen's vision expands beyond engineering and art. He uses technology to enable his ideas, a process ideology that I increasingly employ. Software facilitates the design of complex mechanical systems that mimic nature in its beauty and effectiveness. It allows systems to come together as a whole, as demonstrated in the concept images. The design of this object and its visual appeal are merely a side effect of its purpose—to walk.



Born in 1991, the author of this book likes robots, airplanes, rockets, photography, design, and music. Inside you will find a collection of robots and stuff. If something in here piques your interest don't hesitate to contact the author

— ornstein.mike@gmail.com