

Announcements

ME490B Case study 3: Transportation

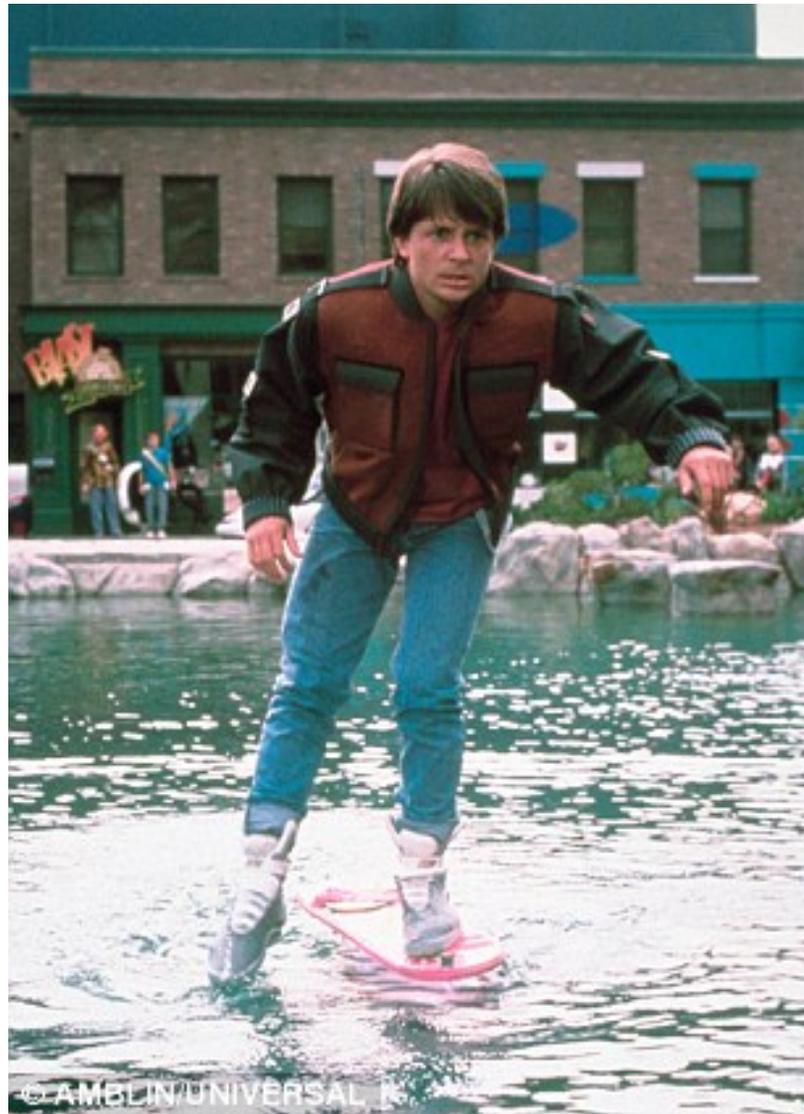
Personal Transporters











Electric skateboards



Remote control



Creativity

- **Creativity:** The ability to produce work that is *useful* and *novel*.
 - Individual creativity is a function of:
 - Intellectual abilities (e.g., ability to articulate ideas)
 - Knowledge (e.g., understand field, but not wed to paradigms)
 - Style of thinking (e.g., choose to think in novel ways)
 - Personality (e.g., confidence in own capabilities)
 - Motivation (e.g., rely on intrinsic motivation)
 - Environment (e.g., support and rewards for creative ideas)
 - Risk taker (e.g., willingness to take reasonable risks)
 - Persistence (e.g., tolerate ambiguity and willingness to overcome obstacles)



5500 BC

The First Wheel



The first wheel

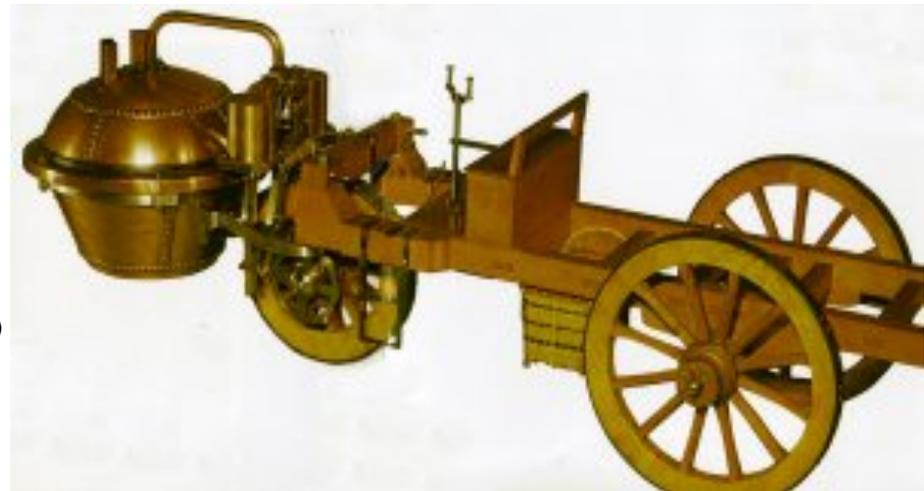
The oldest wheel found in archeological excavations was discovered in what was Mesopotamia and is believed to be over fifty-five hundred years old.

- Humans realized that heavy objects could be moved easier if something round, for example a fallen tree log, was placed under it and the object rolled over it.

1769

Self Propelled Road Vehicle

- Built by French engineer Nicolas-Joseph Cugnotin 1769
- Designed to pull heavy artillery
- Moved at a walking pace and had to stop every 12-15 minutes to raise the steam pressure
- It could pull up to 5 tons



1790 Bicycle

- Introduced in the 19th century
- Twice as many as automobiles.



walking machine

Bicycles



Concept bicycles



1867

The First Motorcycle

In 1876 Sylvester Howard Roper attached a two-cylinder steam-engine to a bicycle and the world's first motorcycle was born

In 1885 Gottlieb Daimler strapped a gas engine to a wooden bicycle and the world's first gas powered motorcycle was born.



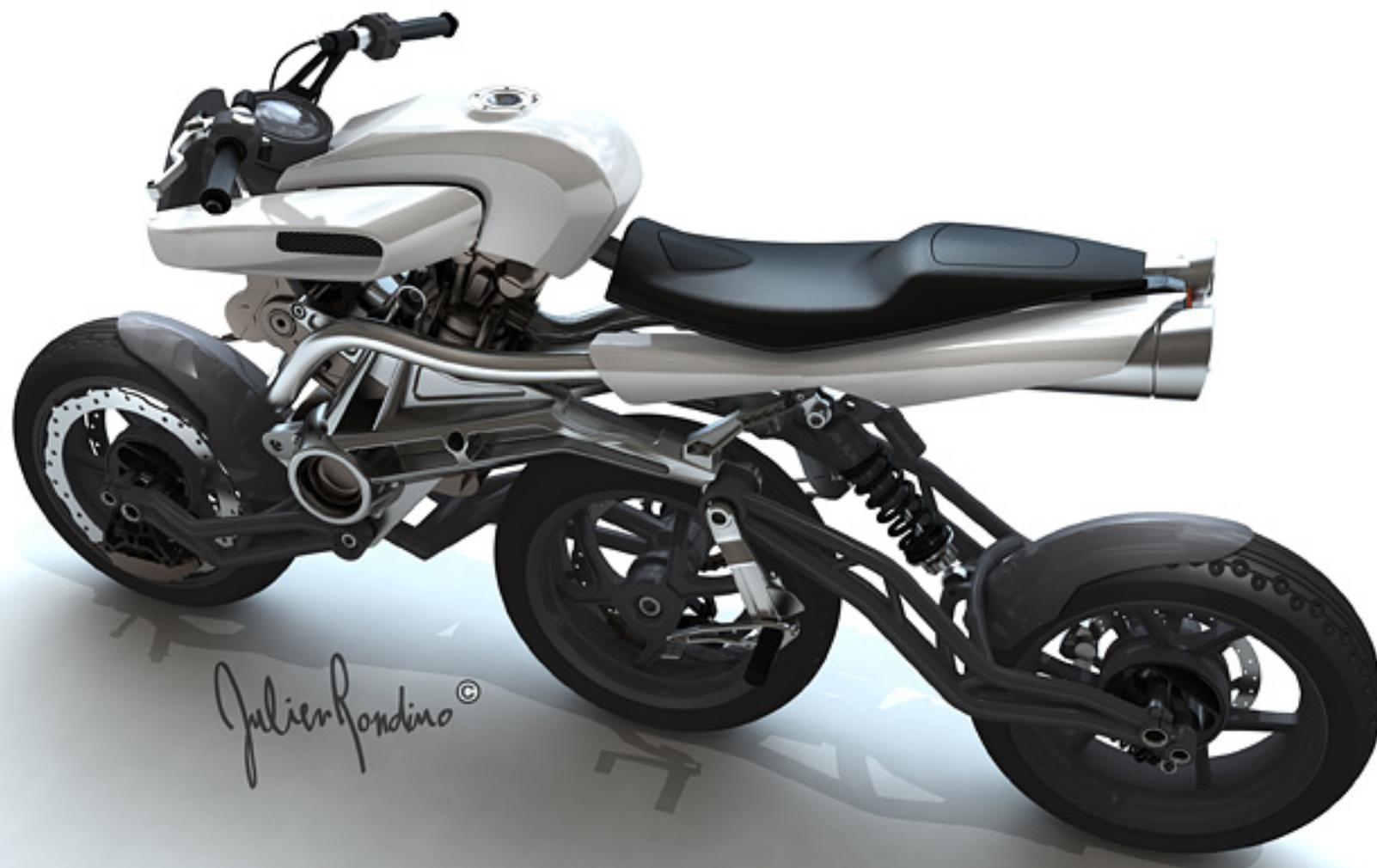
Electric bikes











Julien Rondino®

MOTORCYCLE USA
Courtesy of Julien Rondino

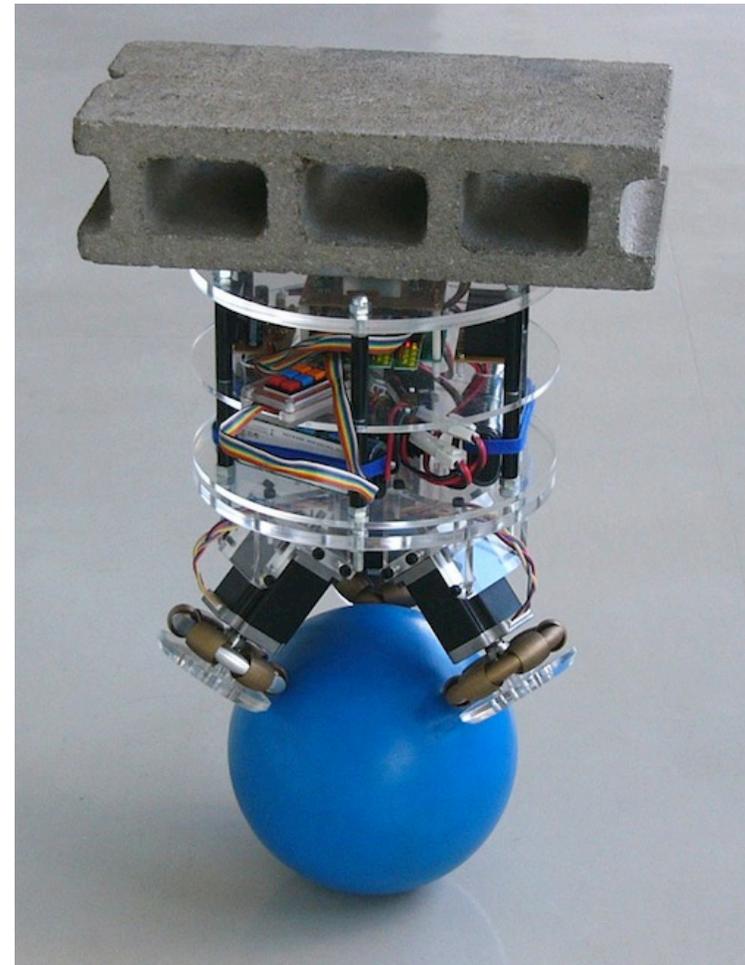


iBOT Mobility System

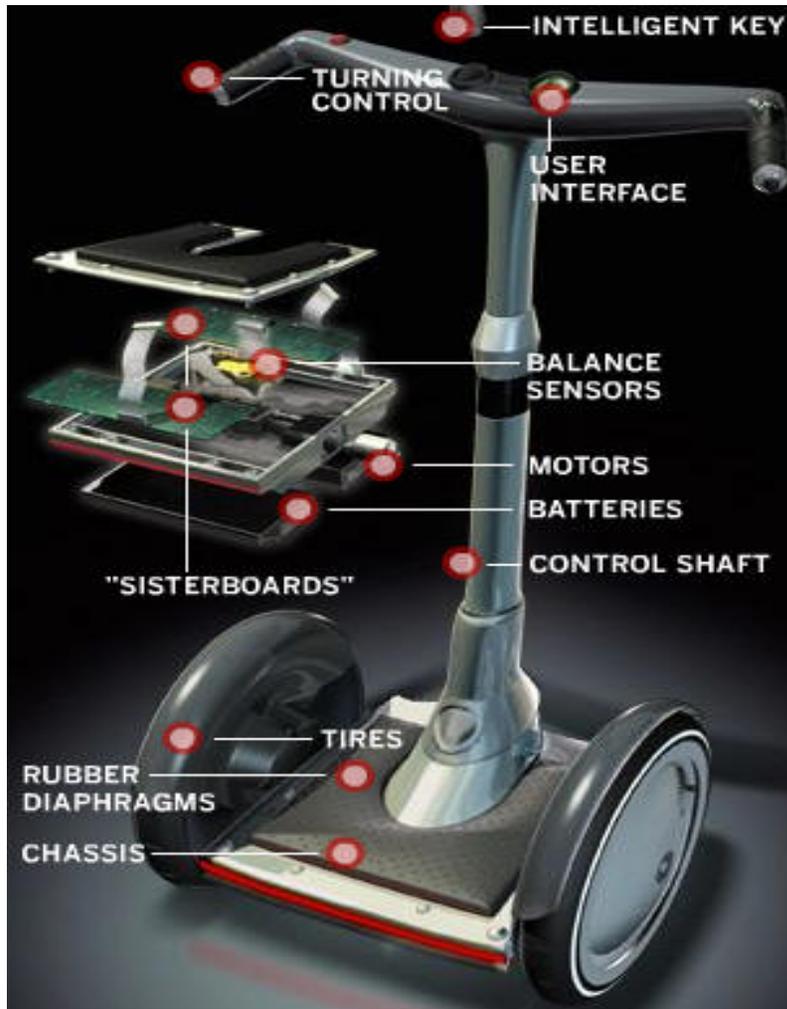
- iBOT mobility system
- Advanced wheelchair that enables users to climb stairs, negotiate sand, rocks and curbs
 - Incorporates a sophisticated balancing system
 - Developed the gyroscopic sensor system
 - Had to satisfy government regulations to be allowed on sidewalks



Balancing robots



Balancing robot?



A complex combination of gyroscopes a motor and sensors

Gyroscopes - always remain in an upright position

Sense which direction "leaning toward"

Send a signal to a network of microprocessors that control several motors

Adjust the directions of the wheels

2001

Segway Human Transporter

Segway PT is a two-wheeled, self-balancing electric vehicle invented by Dean Kamen

Segway PTs are driven by electric motors at up to 12.5 miles per hour (20.1)

Gyroscopic sensors are used to detect tilting of the device which indicates a departure from perfect balance.





Segway Human Transporter

- A self-balancing, two-wheeled scooter invented by Dean Kamen
 - Kamen holds more than 150 U.S. and foreign patents
 - Has received numerous awards and honorary degrees
 - Never graduated from college
 - To Kamen, the solution was not to come up with a new answer to a known problem, but to instead reformulate the problem
 - Segway required numerous external partnerships
 - By 2003, had been adopted primarily for commercial and industrial applications.

Failure modes

- Nothing is perfect
 - <http://www.youtube.com/watch?v=F8oKJbU5MCQ>
- So bikes are clearly safer right?
 - <http://www.youtube.com/watch?v=F8oKJbU5MCQ>
- So maybe we should just go back to horses?
 - http://www.youtube.com/watch?v=j9eI_vS6Cp8
- Well I guess we should just walk everywhere? Totally safe? Nope.
 - <http://www.youtube.com/watch?v=N95qS5qfbVM>
- What is the take-home message?

Innovate, create new ideas

- What is useful for some purposes may not be for everything
- New ideas are rarely perfectly refined
- Refinement is iterative and gradual, innovation may not be instantaneous, but is typically rapid and 'game changing'





Urban transportation?



Successes

- Innovation leads to new things and new ways of thinking
 - <http://www.youtube.com/watch?v=6Y4IEAUtxU0>
- Computers, internet, cell phones, airplanes, GUIs, written word, automobiles, bicycles