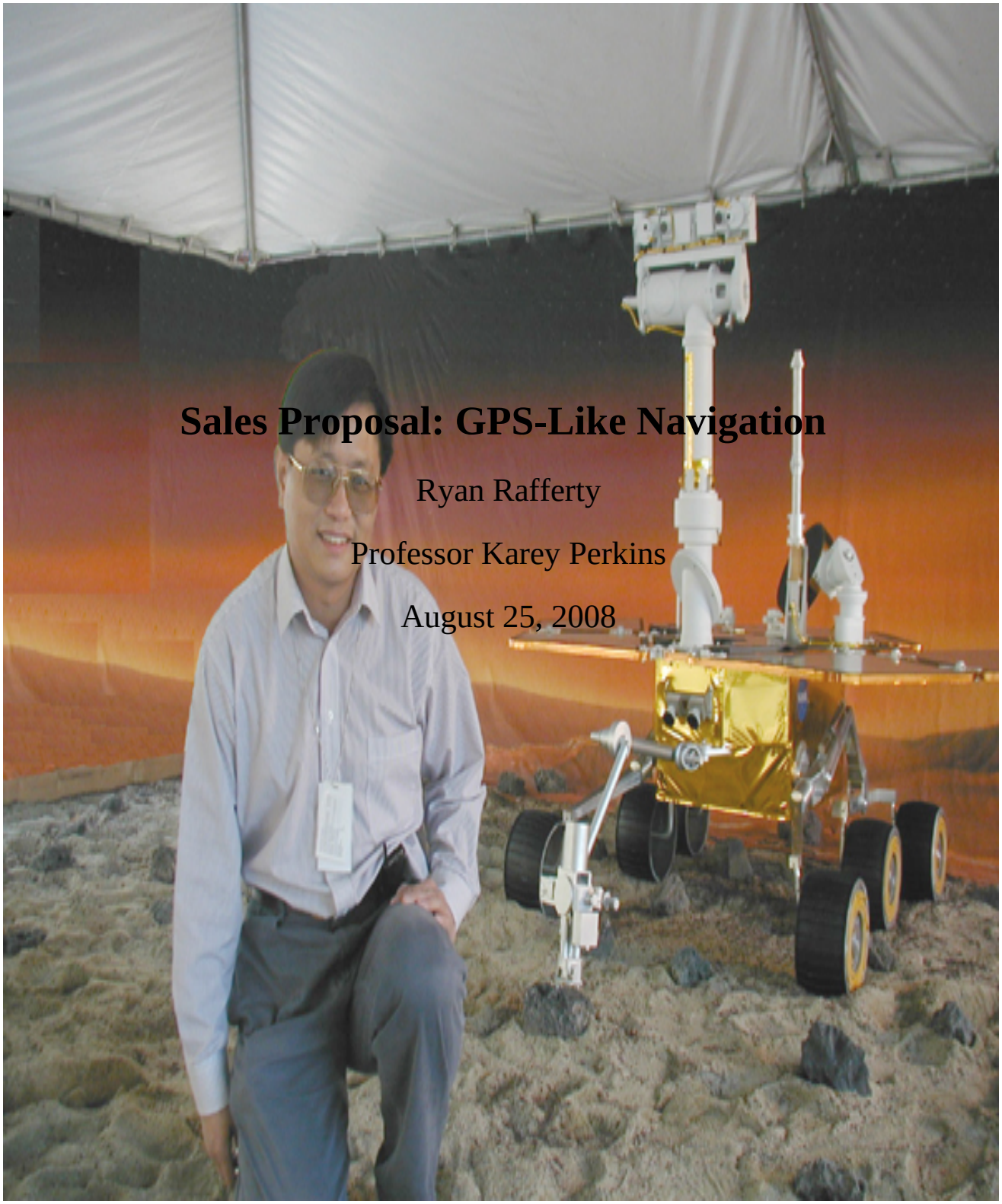

Sales Proposal: GPS-Like Navigation

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Why would you need it?

The exploration of the lunar surface of the moon is a dangerous endeavor. This system is intended to aid astronauts in navigating the surface of the moon with ease and to provide accurate point-to-point transit times while exploring. Since it is difficult to judge distance accurately in the vacuum of space, there exists a significant danger that astronauts get too close to craters or other hazards. This new technology's main focus is astronaut safety while exploring the surface of the moon. There are no geosynchronous navigation satellites orbiting the moon therefore a combination of fixed beacons, topographical images and real-time computer analysis will be used to provide astronauts with GPS-like navigation.

Individual Benefits

The GPS-like navigation system is intended to help terrestrial navigation on the moon. Since there are no GPS satellites orbiting the moon, a new method must be developed to permit astronauts to safely navigate while exploring the surface of the moon. The safety of every individual involved in exploration is always a top priority. The use of the GPS-like navigational system will help promote safety and accuracy while exploring and excavating on the surface of the moon.

Explanation of Technology

Beacons provide the source points for triangulation instead of satellites and the calculated location is displayed on topographical images in real-time very much like a terrestrial based navigation system shows vehicles location on a map. According to Ron Li,

> images taken from orbit will combine with images from the surface to create maps of lunar terrain; motion sensors on lunar vehicles and on the astronauts themselves will allow computers to calculate their locations; signals from lunar beacons, the lunar Lander, and base stations will give astronauts a picture of their surroundings similar to what drivers see when using a GPS device on Earth. The researchers have named the entire system the Lunar Astronaut Spatial Orientation and Information System (LASOIS) (Ron Li, 2008, par. 11).

Also, receivers are on the astronauts and on the vehicles. There are transmitters on the beacons, and the receivers and the radio signal on the beacon that calculate the direction. Since there is more than one beacon on the surface, lines are created in relation to the graphics that were taken of the moon and this provides a graphic for the astronaut.

The LASOIS receivers carried by astronauts on their vehicles calculate a position relative to the location of the beacons then relay that positional information to the astronaut. This gives the

astronauts an accurate visual representation of their location on the surface of the moon relative to known points of interest or danger, such as: edges of craters or the lunar base station.

Strengths

- The system is very simple and provides a highly accurate spacial placement of individual points on the lunar surface.
- It is a new application of an existing and proven technology.
- Humans are a visually oriented species. As such, we are more comfortable using visual aids as opposed to purely text based or mathematical models to orient ourselves within a 3-dimensional space. An example would be the directory map in a mall that displays a big red X in addition to the text, “you are here,” as opposed to a text only description of where you are in relation to points of interest within the mall.
- It is believed that astronauts would be more comfortable using visual aids while in unfamiliar territory and exploring the difficult terrain of the moon.
- This technology can be implemented in a simple device that is easy for the astronauts to learn to operate, and as such promotes safe exploration while on the surface of the moon.

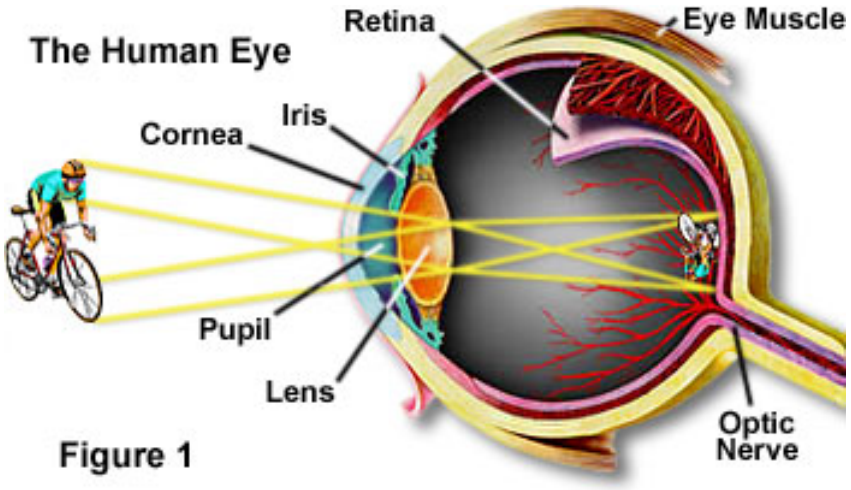

Figure 2: Example of Visual Perception

Weaknesses

- There will be fewer lunar beacons than there are terrestrial GPS satellites.
- This makes the risk of system failure much greater.
- Visual placement of astronauts and vehicles will only be as accurate as the images upon which the positional information is displayed.

Cost

The anticipated cost for implementation and design for the GPS-like navigational system is estimated at $1.2 million dollars, over the course of a three year installment period. $1.2 million will cover the cost of design, parts, and research needed to make GPS-like navigation possible. To put one satellite into orbit for GPS navigation on earth it cost roughly $450 million per space shuttle launch. The GPS-like navigation will not rid NASA of the cost of the launch to get astronauts onto the moon, although the GPS-like navigation system is a much cheaper alternative than an attempt to use geosynchronous satellites on the moon, and also has a much higher probability of success.

> http://www.nasa.gov/centers/kennedy/about/information/shuttle_faq.html#10
> (not sure what to do with this)

Competition

No other companies are attempting to gain GPS-like navigation abilities on the moon. This will be the first of its kind. There is a company trying to gain GPS-like navigation on mars. Using the same technique, not only could GPS-like navigation be gained on the moon, but on mars and other planets as well.

Implementation

Installation would require known, fixed coordinates mapped from space. These are correlated to the maps of the lunar surface. This provides a visual reference to “you are here”.

Use

Any natural resources located on the moon will need to be located while on the surface. In order to extract the resources, exact mapping will be needed to locate the deposits.

Conclusion

Our society is constantly trying to gain new and more advanced techniques of finding natural resources that we could use on earth. Unfortunately the earth only offers so many renewable resources. With the GPS-like navigation system, astronauts would be able to explore the terrain in safely, in search of natural resources to aid our planet in slowing down the rate in which we burn natural resources on earth. The GPS-like navigation system is easy to use, reliable, cheap by comparison and best of all the system supports safe exploration.

Recommendation

NASA will provide Ron Li with funding for the design and implementation for the GPS-like navigation system. The testing and design will be complete and ready for use by August 25, 2011. NASA agrees to a 1.2 million dollar research grant for the period of August 25, 2008 to August 25, 2011.

I, _____, of NASA, agree to the terms above from Ron Li of Ohio State University, and agree to fund (1.2 million dollars) for research and design for the period of August 25, 2008 to August 25, 2011 under the circumstance that the completed product will be ready for use to NASA on August 25, 2020.

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