Quantum Gyroscope

A gyroscope is used to maintain equilibrium and determine orientation. A mechanical gyroscope is what we see in our everyday lives and is the most common. This type of gyroscope was first made in 1817 by a German, Johann Bohnenberger. This type of gyroscope is accurate to a degree and has replaced the once more common magnetic compass. The mechanical gyroscope is now used in most airplanes, helicopters, ships and other mechanisms as the primary navigation tool. But unfortunately there is a limitation to its accurateness and when it comes to measuring the minute changes in the earth’s rotation due to earth quakes (even magnitude 8) the mechanical gyroscope becomes obsolete.

Taking the place of the mechanical gyroscope is the quantum gyroscope. This gyroscope uses super fluids and pressure to detect orientation changes. The super fluid quantum gyroscope was first made by Richard Packard and his colleagues at the University of California; Berkeley (is based on the Josephson Effect). This gyroscope works by manipulating helium isotopes to extremely cold temperatures. Originally the substance used was Helium 3, but it was eventually replaced by its brother, Helium 4. Helium 3 was too expensive and it needed to be cooled to 10-3degreesKelvin (K). Helium 4 on the other hand was far less expensive and only needed to be cooled down to around 2 degrees Kelvin. When these substances are cooled down to those temperatures they lose all of their normal physical properties and become dictated by the strange laws of quantum physics (in essence the vessel becomes like a giant atom). They also become zero friction fluids (no viscosity) and are able to flow continuously through a vessel (\*Josephson’s Effect). To actually measure the orientation (in regards to the earth’s poles) there needed to be a way to measure the pressure differences. Therefore they used a vessel with two parts separated by a weak connection (such as a very fine membrane of silicon nitride), with around 4,200 infinitesimal apertures. When Richard Packard first tested the quantum gyroscope it didn’t do what he expected. When pressure was put on one side of the super fluids they didn’t simply move away or displace but instead oscillated back and forth. When the two super fluids oscillated back and forth they did so through the perforations, causing vibrations. To create this pressure the team used electrostatic pressure, then to attain the sound (of the vibrations) they used the world’s most sensitive microphone and normal headphones. Richard Packard and his team noticed that the whistling sound got louder or softer, depending on the vessel’s orientation in terms to Earth’s rotation axis.

As this is a relatively new field of science there aren’t many uses for a quantum gyroscope just yet, but they are increasing. They will eventually get to the stage where they are the most (or one of the most) used navigation and measurement device. It is trusted by scientists because it is 108 times more accurate than the conventional (mechanical) gyroscope. The quantum gyroscope is very useful for scientists who want to measure how fast the earth is spinning among other changes on earth. There are some specific examples that are being talked about, such as measuring the effect of clouds (yes, clouds) and earthquakes on the speed at which the earth spins. Today it is impossible to measure those instances accurately even if it was a magnitude 8 earthquakes, but with the help of a quantum gyroscopes not only will we be able to see the effect of earth quakes we will be able to detect them before they come. There is such technology out there already but these new devices will be able to more accurately predict the size and time that the earth quake will happen, ultimately saving lives.

A major problem in the field of quantum gyroscopes or just quantum physics in general is that the ideas and objects they create may work on a small scale but what about stepping it up. The quantum gyroscope is incredibly accurate but scientists are trying to create it on a larger scale, broadening the spectrum in which it can be used. Another way to improve this technology would be making it less costly. As I’ve said before, this is a fairly new technology and therefore it seems fitting for it to be expensive, well that and it’s dealing with high tech equipment, costly isotopes of helium and not to mention quantum mechanics. But in general the newer the technology the more expensive it is. Therefore in the future the price is going to go down drastically and the uses are going to rise. Another way that this technology can help keep us safer is through its precision navigating. After the last few incidences with cruise ships and the thousands of car crashes, you would think we would catch on. With this new precision navigation there should be fewer errors in our vehicles and other vessels (as long as other technology keeps up) and more lives can be saved. This precision navigating will also open the market to the exponential advancement is space navigation. The quantum gyroscope will leave less room for human error and will allow new technologies to forged out of its advancements. But, according to Richard Packard "to make a practical device would take 5 man-years and a skilled researcher." This makes sense considering that the project is no longer funded by any agencies or companies.   
    There is no exact cost of the quantum gyroscope because for this type there is only one in the world. At the time of their research they were funded by NASA, but as of now they are not funded. But considering all of the high tech equipment that was needed to preform the expiriments and the other expensive materials (such as Helium 3 and Helium 4), not to mention the salaries of the researchers, I conclude that this was a very expensive research project.