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My idea proposes the use of ferrofluid for attitude control. Since ferrofluid is a magnetic liquid and can be controlled with an induced magnetic field, it can be manipulated to act as other attitude control systems already in use without the potential failures that they are prone to, which brings us to its strengths:

The ferrofluid system doesn't contain any mechanical parts that can fail. The only moving part would be the ferrofluid, which would be formerly sealed and contained within its own isolated system. This gets rid of mechanical failures which may include wear, friction, and thermal shock, since ferrofluid isn't affected by temperature.

Ferrofluid can also be very dense under magnetic loading. In fact, when under full magnetic load, it is 20 times denser than water at a density of 20 grams per cubic centimeter. An active ferrofluid under magnetic load that can fit in an average water bottle would weigh over 50 pounds. But this is only true for the portion that is magnetic and under magnetic load, meaning when a magnetic field is present. When it's under no magnetic load, particle separation or density separation isn't present, and the average density at a state of particle consolidation is a little over 3 grams per cubic centimeter, which is still 3 times denser than water. This feature of density variation comes at an advantage. Different strengths of magnetic fields would cause different densities which gives us the opportunity to have a variable magnitude of momentum when the system is rotating at a constant angular speed (Scherer & Neto, 2005).

As mentioned before, ferrofluid's properties is resistant to temperature changes. Ferrofluid is currently used in precise audio speakers because they are great at eliminating heat from the voice coils and act as passive dampeners. The carrier fluid oils in ferrofluid have very low volatility and high thermal stability. This makes thermal planning in compact applications a beneficial factor (Merchant, 2013).

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While ferrofluid has great attributes and vast potential applications, not much progress has been done in behavior research due to its complexity, which brings us to its weakness. Major analysis and testing are required when applying ferrofluid to applications because it's itself a changing magnetic field. While it is simple to predict and analyze a stationary magnet and its magnetic fields, ferrofluid's magnetic field changes in both intensities and direction and sometimes multiple fields may be present at a time if enough particle separation occurs. You could imagine the difficulty in attempting to simulate its magnetic field behavior over time, it's similar to analyzing multi-body orbits but the orbiting bodies are now also changing in their masses and gravitational pull (Scherer & Neto, 2005).

A possible weakness could also be sloshing. Since ferrofluid is a fluid it sloshes around similar to how fuel would slosh around the tank on spacecrafts. This slosh can cause instability and orbit perturbation. A simple solution and most likely a set requirement, is to ensure that the enclosed system of ferrofluid contains no air and is completely filled.

There isn't an alternate type of magnetic fluid available but an alternate solution that's similar to our methodology would be to submerge a solid magnet or solid metal in an oil base and use magnetic fields to move them within the fluid.

The only strength that this could have over the ferrofluid would be the complexity. Since you're only working with a single object that may or may not be magnetized, analyzing the magnetic fields should be simpler. The weaknesses however are far more severe. Utilizing an object in the oil wouldn't have a great ratio of rotational density to stationary density and your momentum would be lacking, not to mention that we also lose the ability of having a variable momentum. You also have the issue of having the object repeatedly impacting the walls of your enclosed system causing wear on the internals. This would also result in perturbation with the internal collisions wreaking havoc on your orbit stability.

Utilizing ferrofluid instead would allow us to have more control over the system with less internal perturbation, a controlled and variable momentum, and the elimination of internal wear. The advantages are well worth the extra effort and time that will be needed to analyze the behavioral complexity of ferrofluid.

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