

Kitbot Swerve

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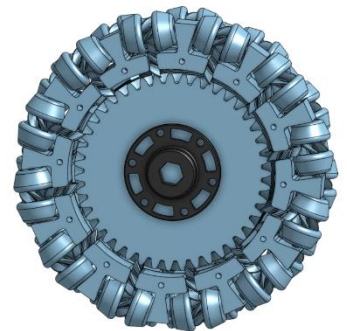
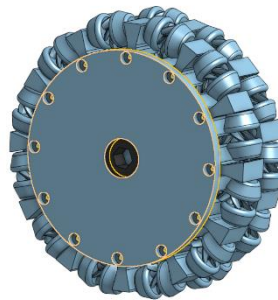
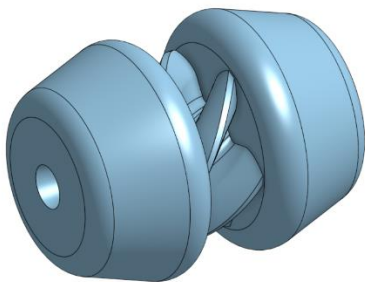
As more teams switch to swerve drive as their drivetrain of choice, many teams are being left in the dust as Tank, WCD, Mecanum, and Holonomic drivetrains, which are just not as effective both in agility and defense, are being phased out of FRC. The best example of this was most robots on the 2022 Einstein field being Swerve robots. Swerve is just plain out of reach for so many teams because of costs, lack of mechanical and programming knowledge, and custom chassis.

While this solution does not address these problems perfectly, one major benefit is that teams wouldn't need to design and construct custom chassis. While this is a small and some could argue, negligible solution to a big problem in the FRC space, it is still an interesting concept that teams could implement at least slightly easier than swerve drive.

This design was derived from the omBURo robot by professors Shen and Hong at UCLA. Their design was made for a unicycle pedestrian vehicle. There were recognizable applications for robotics and their design was altered for use in FRC. Their paper linked below:

<https://arxiv.org/pdf/2001.07856.pdf>

The proposed design for an alternative to swerve drive is called "Kitbot Swerve" so named because it can be implemented on the AM-14U4 chassis from AndyMark Inc. and because it does not sacrifice agility like a tank drive but also doesn't sacrifice defensive capabilities like a mecanum drive would. This design uses traditional omni-directional wheels but with one major difference: the casters on the outside of the omni-wheel are actively driven.



This works by having two motors drive one wheel. One motor drives the wheel itself, while the other drives the casters. The wheel includes 3 sets of gears. One central gear, one set of idlers, and the driven gears. The casters have gears in them which are driven by the idlers.

By using 4 of these wheels on each corner of a robot. We can replicate the agility of a swerve drive by running the casters and the wheels at the same time.

While this is an interesting design, there are also some limitations. Due to the nature of the design, there has to be a gear train in the wheel in order for the wheel to function correctly. This means the wheel is geared to have a decreased torque and increased speed. This can be counteracted by gearing the motors for torque in a gearbox before going into the wheel.

This design could possibly be something that teams could implement easier than swerve drive. Further design and testing is required before this could be properly used on a robot. Unfortunately due to personal limitations, development of this solution may come extremely slowly. This is unavoidable. However, there will be updates as they roll out including when the gearbox is developed. Of course if there are teams who would want to try to implement this design faster, the CAD (and code when it is developed) will be published as open source on Onshape and Github respectively.

Wheel CAD:

<https://cad.onshape.com/documents/a52b463ef345c5677b5ef4ef/w/6e6e555146438c5230e1de94/e/e5398684376605bbad8d729>

Feedback is welcome!!