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SAE Formula Car

With continual advancements in technology and material stability, the automotive industry is working at full speed to stay up to date and come out with new, substantial innovations that make their car one step ahead of others. At this day and age, many car customers are concerned with low energy, fuel efficient, and drivability (Liu, 41). A large amount of recent research has been on transmissions since they are essential to those three concerns. Manual transmissions (MT) are known to have the highest efficiency at 96%, with automated manual transmissions (AMT) following next at 86% efficiency (Galvagno, 1878). The AT, though less fuel efficient, has much better drivability due to its smooth shifting quality. “A Dual Clutch Transmission, aims at optimizing the advantages of MT and AMT offering high efficiency and excellent shifting quality” (Galvagno, 1878). Many other articles have proven that Dual Clutch Transmissions yield better dynamic performance and shorter shifting time.

For the AMT, actuator dynamics has been overlooked recently which is a real issue. “(This) cannot be neglected at all, since it can considerably affect shifting performance.” (Lucente, 74). Though technically it is not unknown, actuator dynamics needs to be explored more. The other topic, the Dual Clutch Transmission, has issues when looking at the electrical and mechanical control strategy. Many different articles have different control designs for the Dual Clutch Transmission. There are so many different plans because this is a fairly new concept in the automotive industry so there is a lot of room for innovation, however that is proving how complex this concept really is. Though much research has gone into studying the concept and physics of Dual Clutch Transmissions, the optimal design is still unknown (Hao, 430). Dr. Oh studied a way to improve the clutch control performance and its durability which was successful but he believed there had to be better ways to ensure precision (Oh, 460).

The Formula group that is taking 435 in the Summer group has split the transmission project into two parts: a fabricated Automated Manual Transmission and a finalized Dual Clutch Transmission design to hopefully use on future formula cars. Much of the research will be done in order to come up with the best possible design of the Dual Clutch. Since everyone in the group is studying mechanical engineering, they will need to do a lot of research on the electrical components of transmissions in order to fully integrate the transmission into the car.

References

Galvangno, E. Analysis and simulation of a torque assist automated manual transmission. *Mechanical Systems and Signal Processing*. (2011). 1877-1886.

Hao, J. Dynamic Simulation of Shifting Process of a Novel Dual-Clutch Transmission with One-way Clutches. *International Journal of Digital Content Technology & its Application* (2013). 423-430.

Liu, Y. Shift control strategy and experimental validation for dry dual. *Mechanism and Machine Theory*, 41-53.

Lucente, G. Modeling of an Automated Manual Transmission. *Mechatronics 17.* 2007. 73-91

Oh, J. J. Driveline modeling and estimation of individual clutch torque. *Mechatronics*, (2014). 449-463.