

SAE Baja Design

CONCEPT GENERATION AND SELECTION

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Overview

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1. Introduction

- This is the Drivetrain Design for the SAE Baja Competition Team
- The purpose of our team is to define and design the best possible drivetrain for the specific use of a single seater off road buggy.
- Our most pressing issue is the identification of the best possible transmission. (CVT, Automatic or Manual)
- As we progress through our presentation we will clarify what our best solution is and how we came to this conclusion.

2. Concept Generation

a. Continuously Variable Transmission

b. Automatic Transmission

c. Manual Transmission

Continuously Variable Transmission

Introduction:

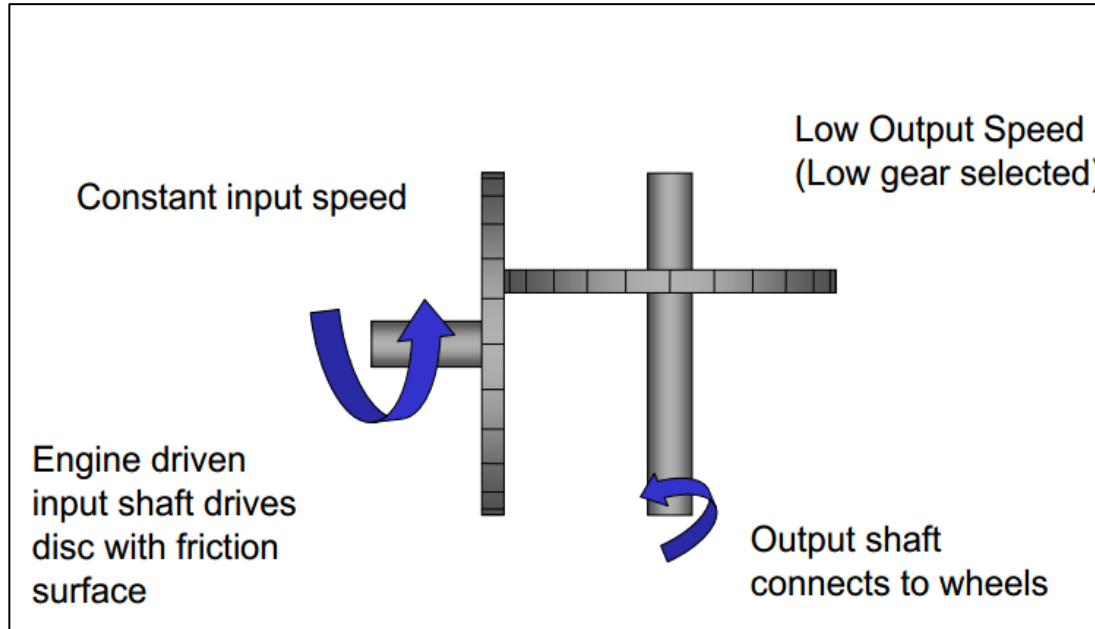
- One kind of automatic transmission.
- Transfer the range of power and torque from engine continuously.

Different type of CVTs

- Friction drive
- Pulley drive
- Toroidal drive

Friction Drive

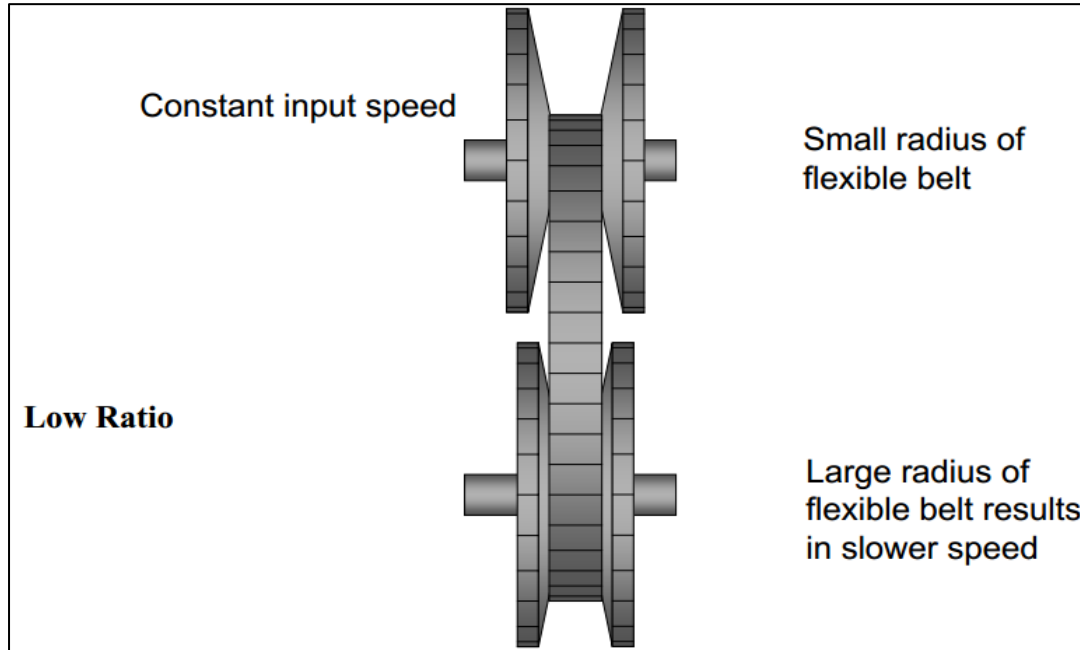
Friction Drive CVT Basic Concept



Source: https://d2t1xqejof9utc.cloudfront.net/files/19153/eti_19_CVTtransmission.pdf?1363999370

Pulley Drive

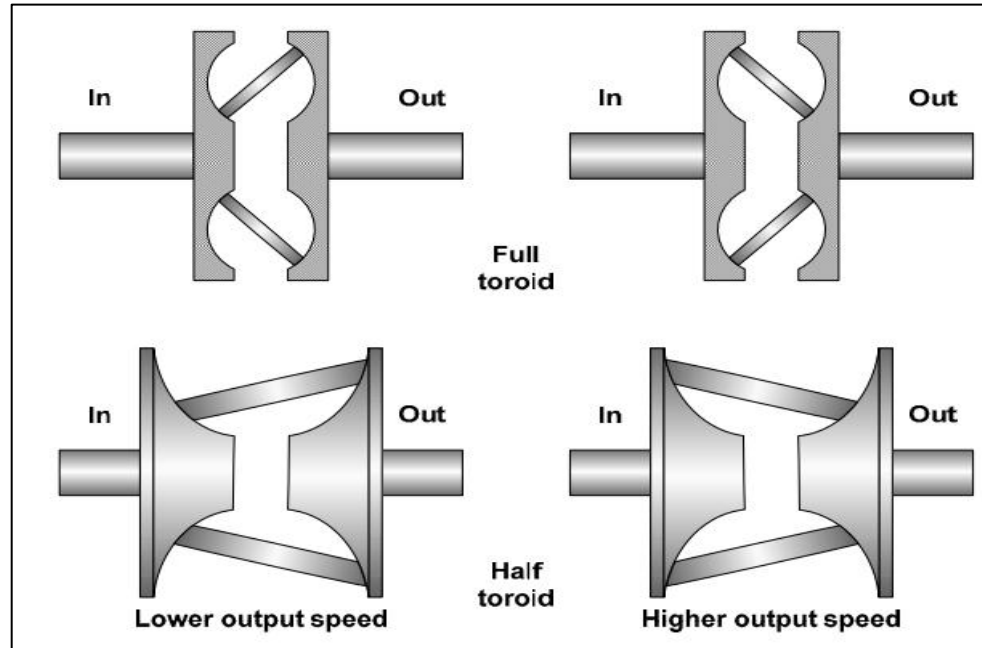
Pulley Drive CVT Basic Concept



Source: https://d2t1xqejof9utc.cloudfront.net/files/19153/eti_19_CVTtransmission.pdf?1363999370

Toroidal Drive

Toroidal CVT Basic Concept



Source: https://d2t1xqejof9utc.cloudfront.net/files/19153/eti_19_CVTtransmission.pdf?1363999370

Advantages

- Do not need to shift gears
- Transfer the power continually
- Good fuel efficiency
- Have a wide range of gear ratio

Disadvantages

- The system cannot afford too much torque.
- Do not have a reverse.

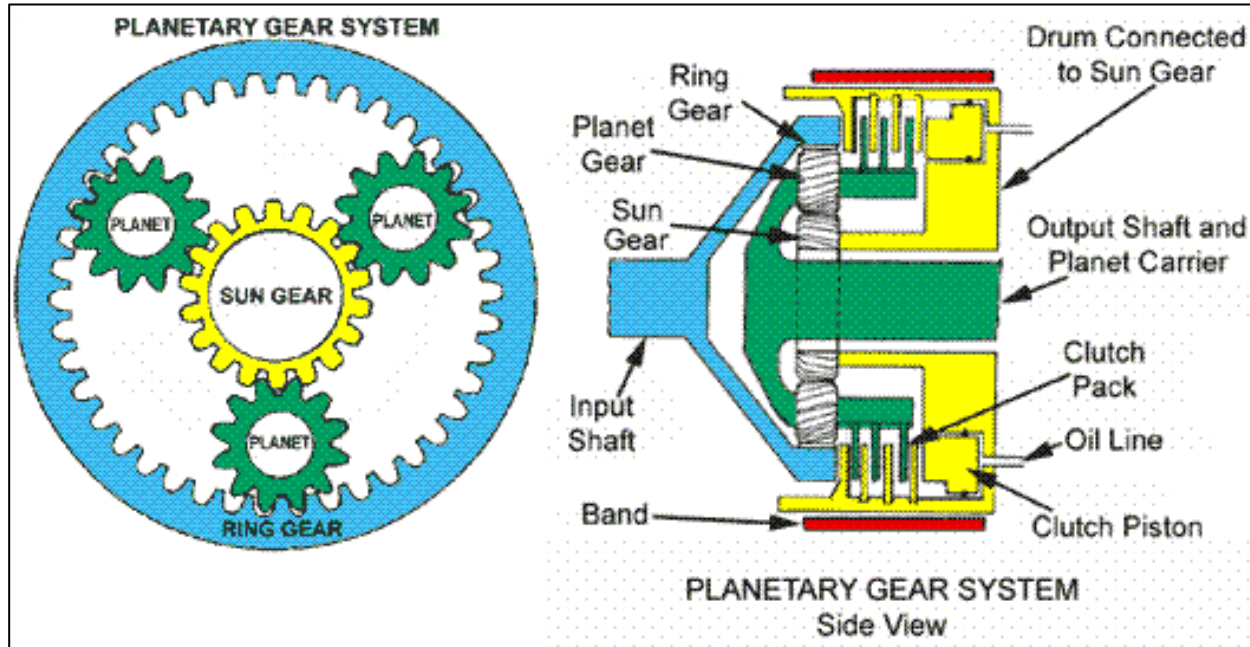
Automatic Transmission

Introduction:

- One type of motor vehicle transmission.
- Can automatically change gear ratios as the vehicle cycles from low rpms to high rpms.

Planetary Gear System

Planetary Gear System



Source: <https://www.carparts.com/transmission.htm>

Advantages

- Good performance in rough road.
- Easy to drive.
- Low failure rate.

Disadvantages

- Lower fuel efficiency.
- Higher price.
- Higher maintenance cost

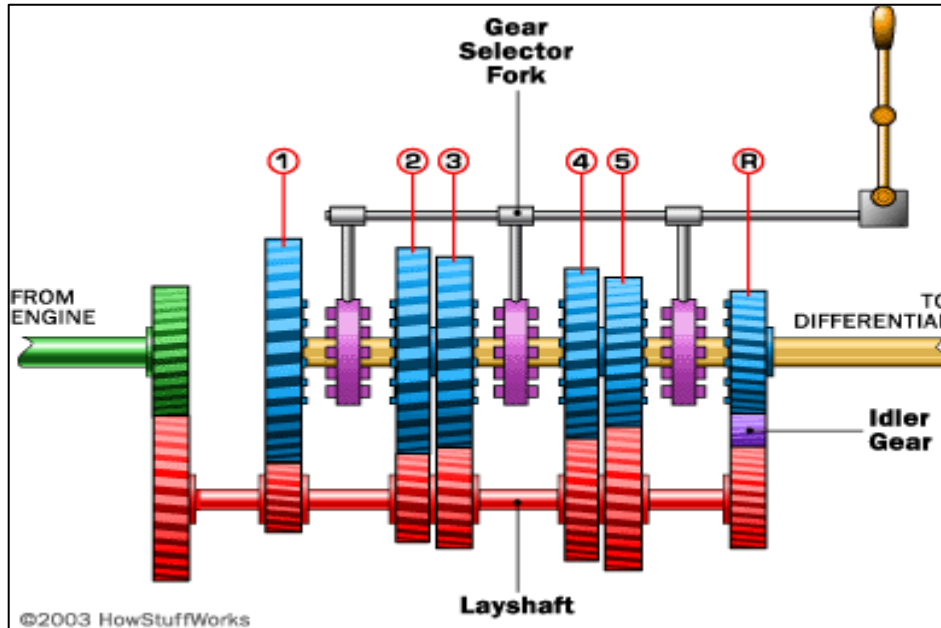
Manual Transmission

Introduction:

- One type of vehicle transmission.
- Switch between the different gear ratios manually.

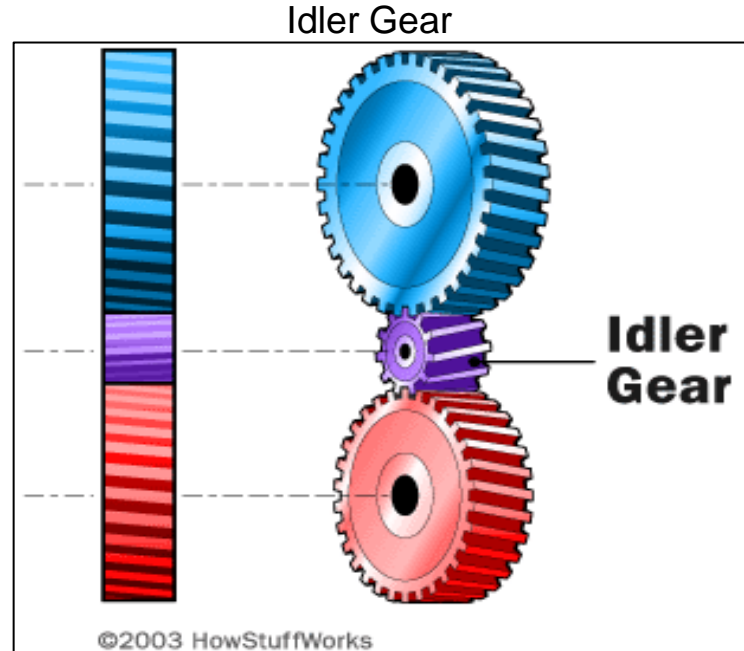
Manual Transmission

Manual Transmission Basic Concept



source: <http://www.howstuffworks.com/transmission4.htm>

Reverse in Manual Transmission



Source: www.howstuffworks.com/transmission4.htm

Advantages

- The driver has the ability to switch gears for higher rpm which helps in hill climbing.
- Allow for a better acceleration as the driver can switch gear to maximize that.

Disadvantages

- Low drivability.
- Low efficient comparing with CVT transmission.

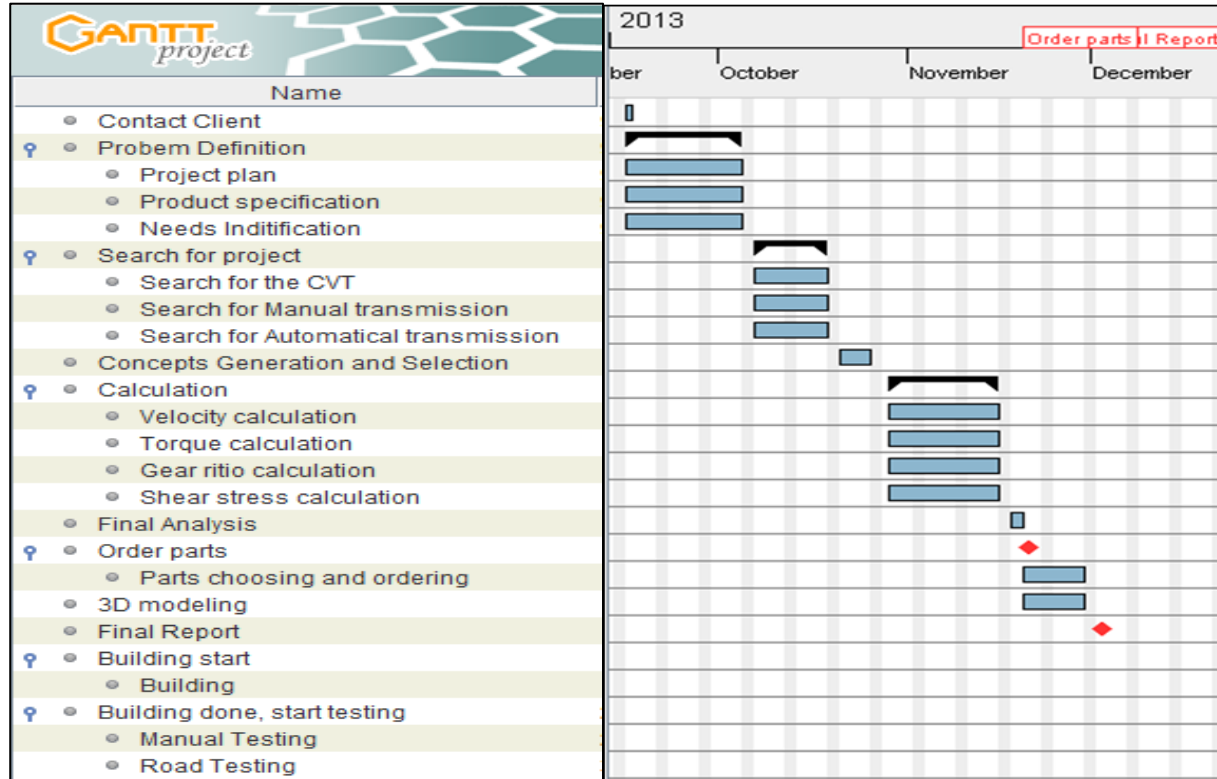
3. Concept Selection

Decision matrix

Concepts	CVT	AT	MT	WEIGHT
Durability	1	2	3	10%
Maintenance	2	1	3	5%
cost	1	2	3	15%
Reversibility	2	3	1	10%
Drivability	3	2	1	25%
Acceleration	3	1	2	15%
Energy Efficiency	2	1	3	10%
Weight	3	2	1	10%
Weighted Total	2.25	1.8	1.95	100%

4. Project Plan

Gantt chart



5. Conclusion

- Through the Decision Matrix presented on slide 20, our team concluded that the CVT would be the best possible solution.
- This confirmed our initial expectations from the beginning of the semester.
- The Baja team as a whole wanted to use a CVT because most high ranking teams in prior competitions used a this system.
- Though the system cannot handle overly barring amounts of torque, the Briggs and Stratton engine will fit this constraint perfectly.

6. References

1. Continuously variable transmission(CVT)

https://d2t1xqejof9utc.cloudfront.net/files/19153/eti_19_CVTransmission.pdf?1363999370

2. CVT Transmission

<http://www.insightcentral.net/encyclopedia/encvt.html>

3. How Manual Transmissions Work

<http://www.howstuffworks.com/transmission4.htm>

4. A Short Course on Automatic Transmissions

<http://www.carparts.com/transmission.htm>

Questions?