ME3425: Mini Project Group 1

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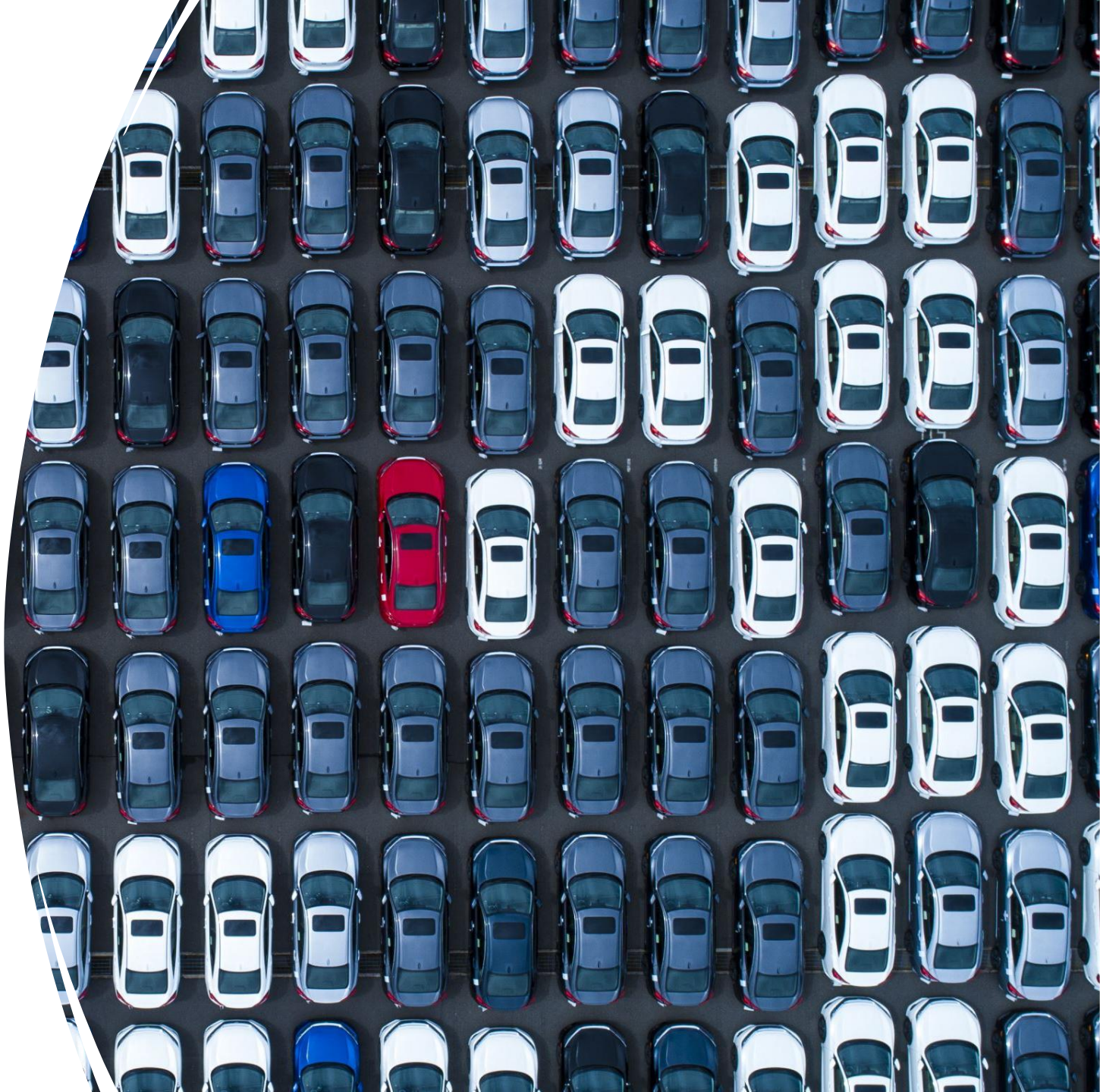


Our Ideas

- Gearless Transmission
- Theo Jansen Mechanism
- Stair Climbing Trolley

Gearless Transmission

Problem with Bevel Gearing:

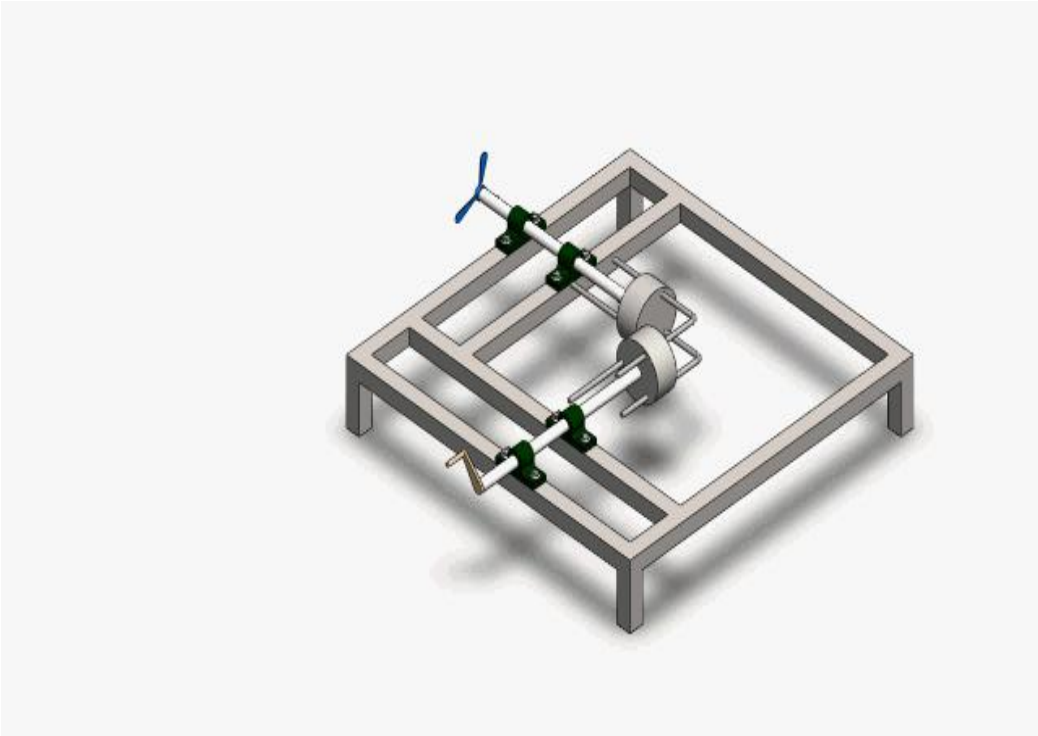
- Complex manufacturing process.
- High replacement cost.
- Prone to jamming due to backlash errors.
- Increased noise from pitch mismatches.

Proposed Solution:
Gearless Elbow Mechanism

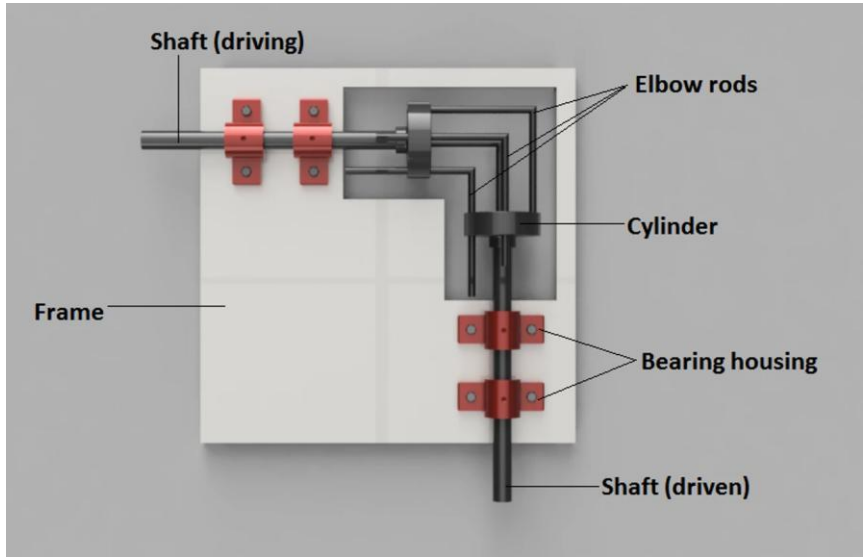
- Transmits motion and power between non-parallel, co-planar shafts.
- Eliminates gears using elbow rods, a hub, and shafts.
- Operates on slider and kinematic chain principles.

Applications:

- **Robotics**: Precision motion and power transmission.
- **Pumping/Compression Devices**: Smooth and efficient operation.



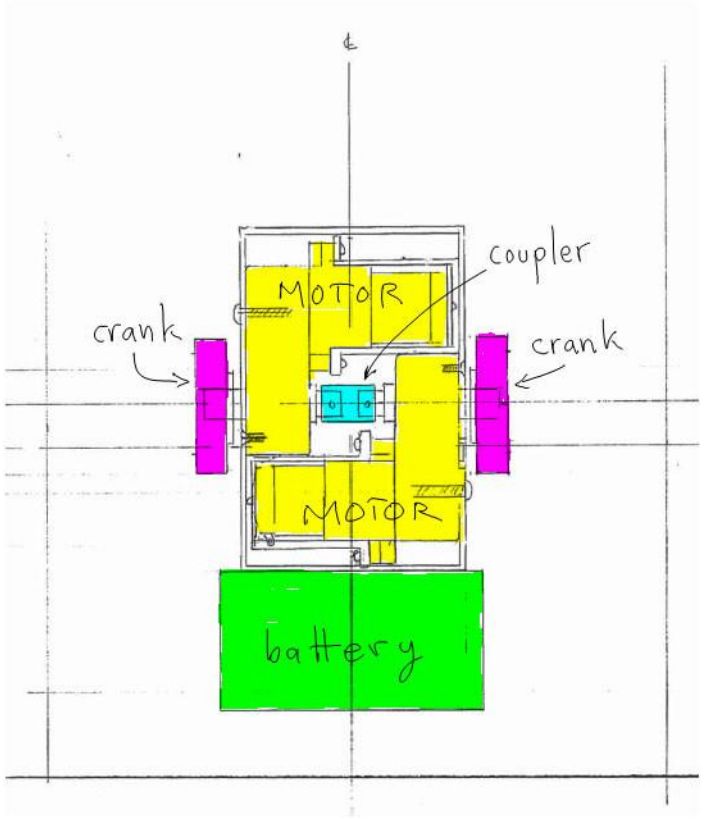
Mechanism and Material Selection

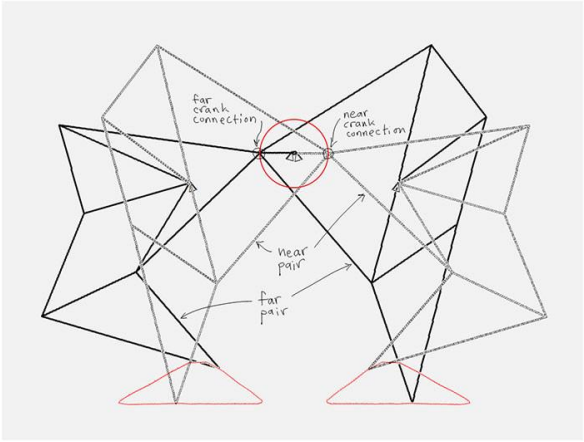


Parts	Dimensions
Cylinder	50mm Diameter
Shaft	15mm Diameter
Links	10mm Dia 70mm Length
Bearings	15mm inner Dia
Frame	70cmX70cm

Estimated Budget

Components	Quantity	Price* (INR)
Ball Bearings	2	600
Metal Rod/Link	3	400
Metal Rod/shaft	2	600
Cylindrical Hub	2	1000
Nuts and Bolts	-	100
Wooden Frame	-	1000
Miscellaneous		500
Total		4200





Theo-Jansen Mechanism

Motivation:

•The Theo Jansen mechanism is inspired by the movement of animals, particularly the motion of legged creatures.

•It offers an innovative way to create walking robots without traditional actuators or motors in each leg.

•The mechanism is known for its simplicity, stability, and efficiency in generating walking motion.

Introduction:

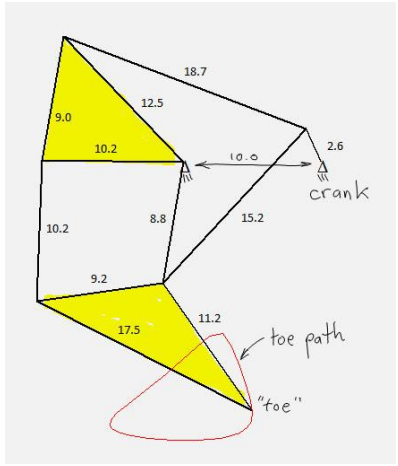
•Developed by Dutch artist and engineer Theo Jansen, this mechanism simulates the walking behavior of a spider-like creature.

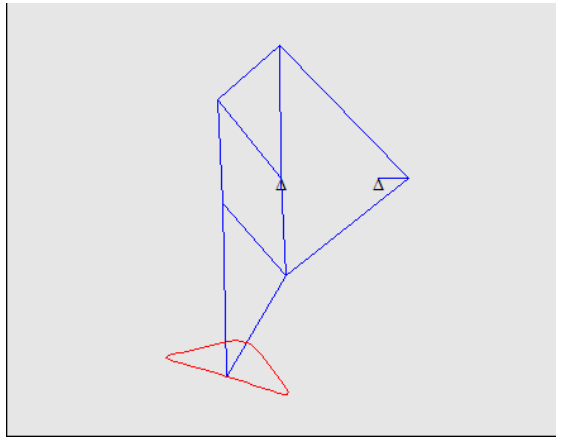
•It uses a set of linked rods and legs to create a walking gait.

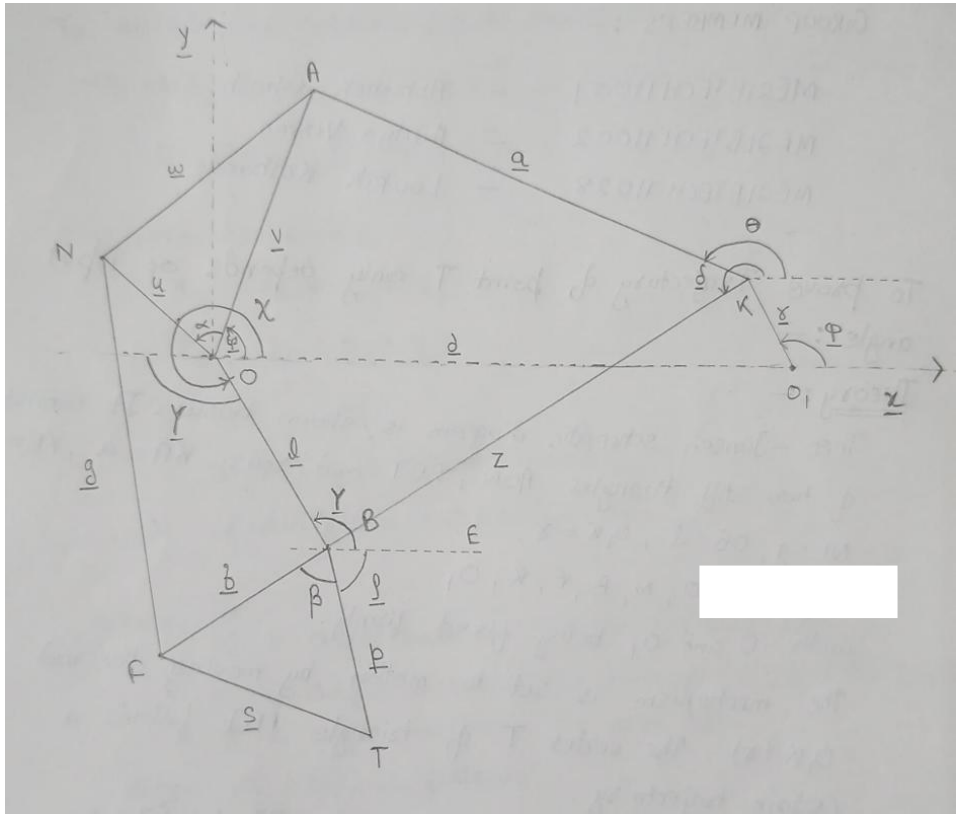
•The design has been used in various art installations and has practical applications in robotics and engineering.

Mechanism

- It consists of 2 stiff triangles AON, FBT, and rods KA=a, KB=z, NF=g, OB=l, O1K=r.
- Hinges at A,O,N,B,F,K,O1 with O and O1 being fixed firmly.
- The mechanism is set to motion by moving rod O1K(r). The Vertex T of triangle FBT follows a certain trajectory.
- In order to follow optimal trajectory, we need to find numerical values of parameters a, z, d, g, l, v, u, w, f, p, s, r.







Estimated Budget

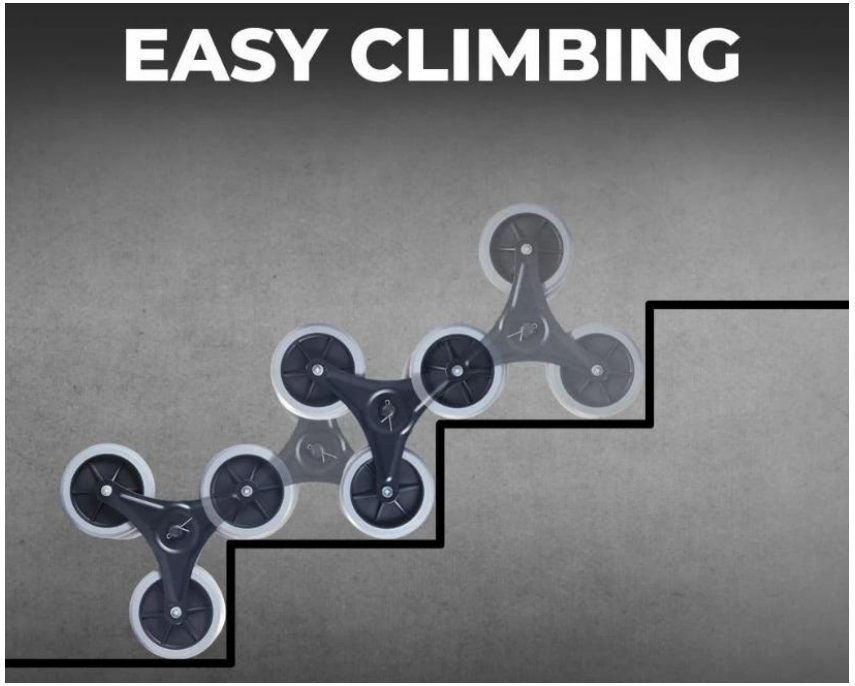
Components	Quantity	Price (INR)*
Wooden Strip (10cm long)	40-50	1500
Battery and Battery Holder	2	300
Motor (20rpm)	1	600
Screws and Bolts	-	200
Miscellaneous	-	500
Total		3100

Stair Climbing Trolley

- **Introduction**:- A Staircase Climbing Trolley equipped with a tri-star wheel mechanism.- Facilitates load transportation over stairs and uneven surfaces.
- **Motivation**:- Difficulty in carrying heavy loads over stairs.- Limited lifting facilities (e.g., no elevators or conveyors).- Reduces physical strain and risk of injury when lifting loads manually.

Mechanism

- **Mechanism**:- Three wheels mounted at the vertices of an equilateral triangle.- Central shaft drives the triangular set of wheels.- Rolling contact allows for efficient climbing over stairs and obstacles.
- **Material Selection:-**
  - **Trolley Body**: Mild Steel-
  - **Wheel Web**: Stainless Steel Grade 304-
  - **Bearing**: SKF 6006 Deep Groove Ball Bearing-
  - **Wheels**: Filled Rubber



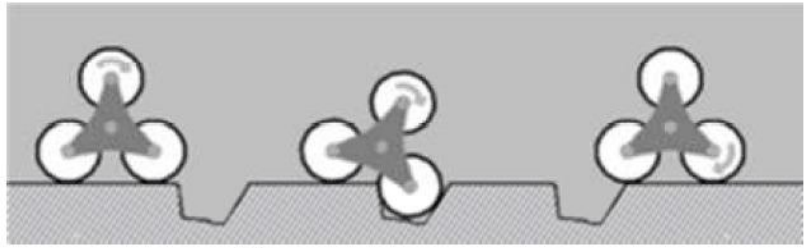


Fig Tri-Star wheel in motion

Estimated Budget

Components	Quantity	Price* (INR)
Rubber Wheel (OD=150mm)	6	1500
Ball Bearings (D=30mm)	4	240
Steel Components(Plate 300mmX400mm) and Hollow Pipe (OD=30mm,ID=26mm of 4m)	-	1000
Tri-Star Wheel Web	4	700
Welding, Finishing and Miscellaneous	-	1500
Total		4940

Thank You