

Design process

1. Task definition
2. Generating ideas
3. Concept selection
4. Detailed design
5. Prototyping/building
6. Testing

90% of design characteristics are generally determined at 10% of project time

All of you are now at this stage

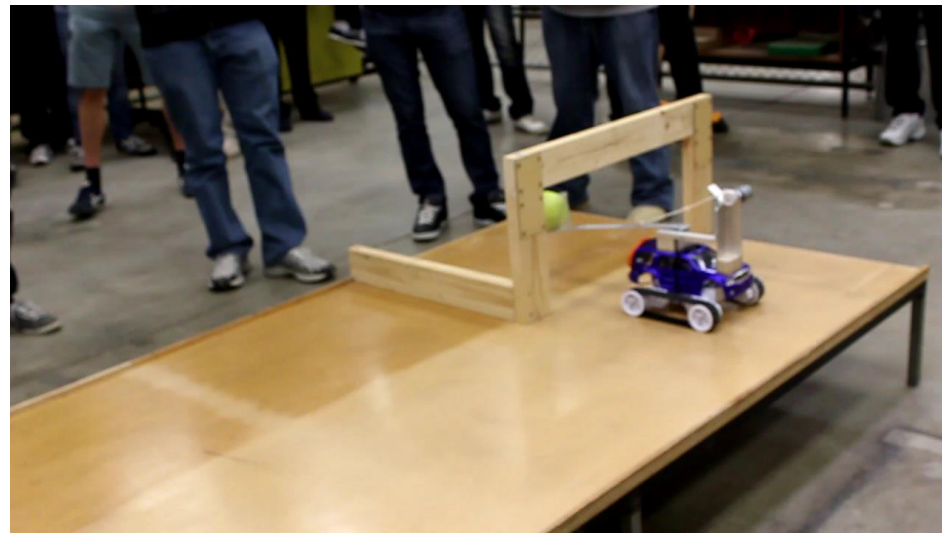
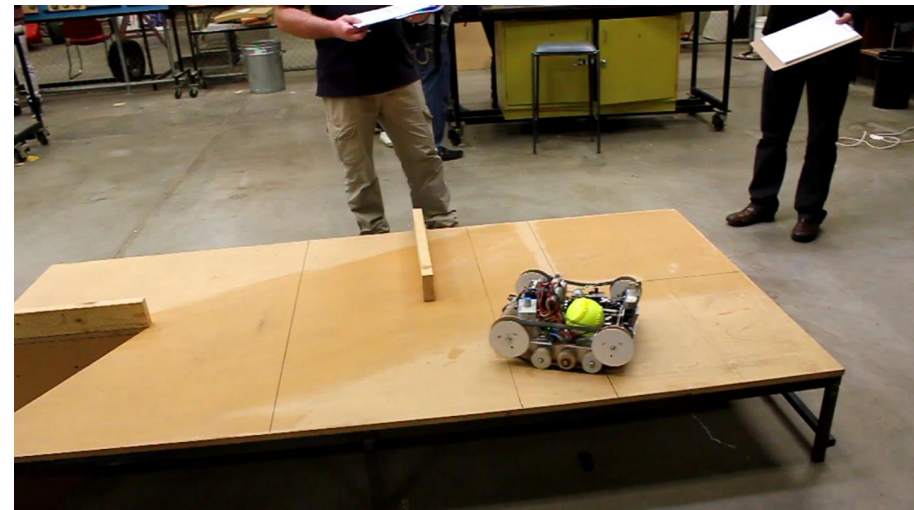
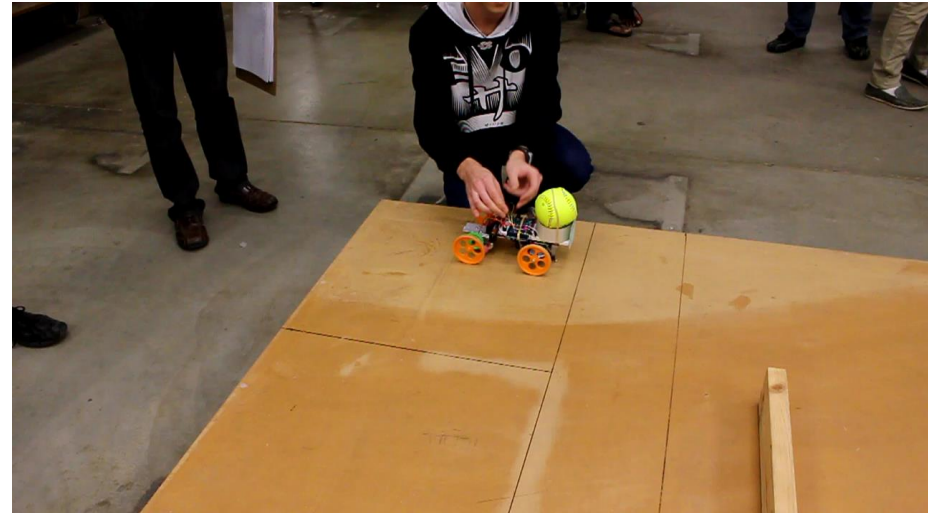
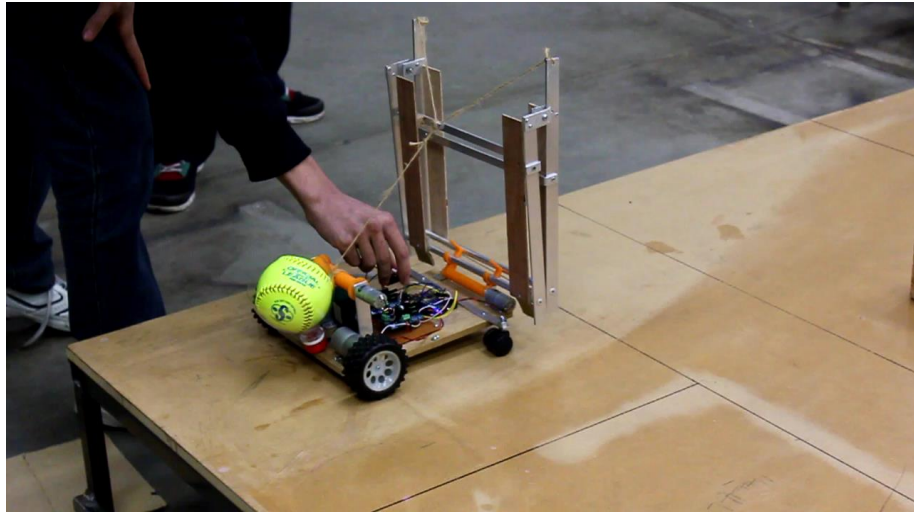
- **Success of a final design**

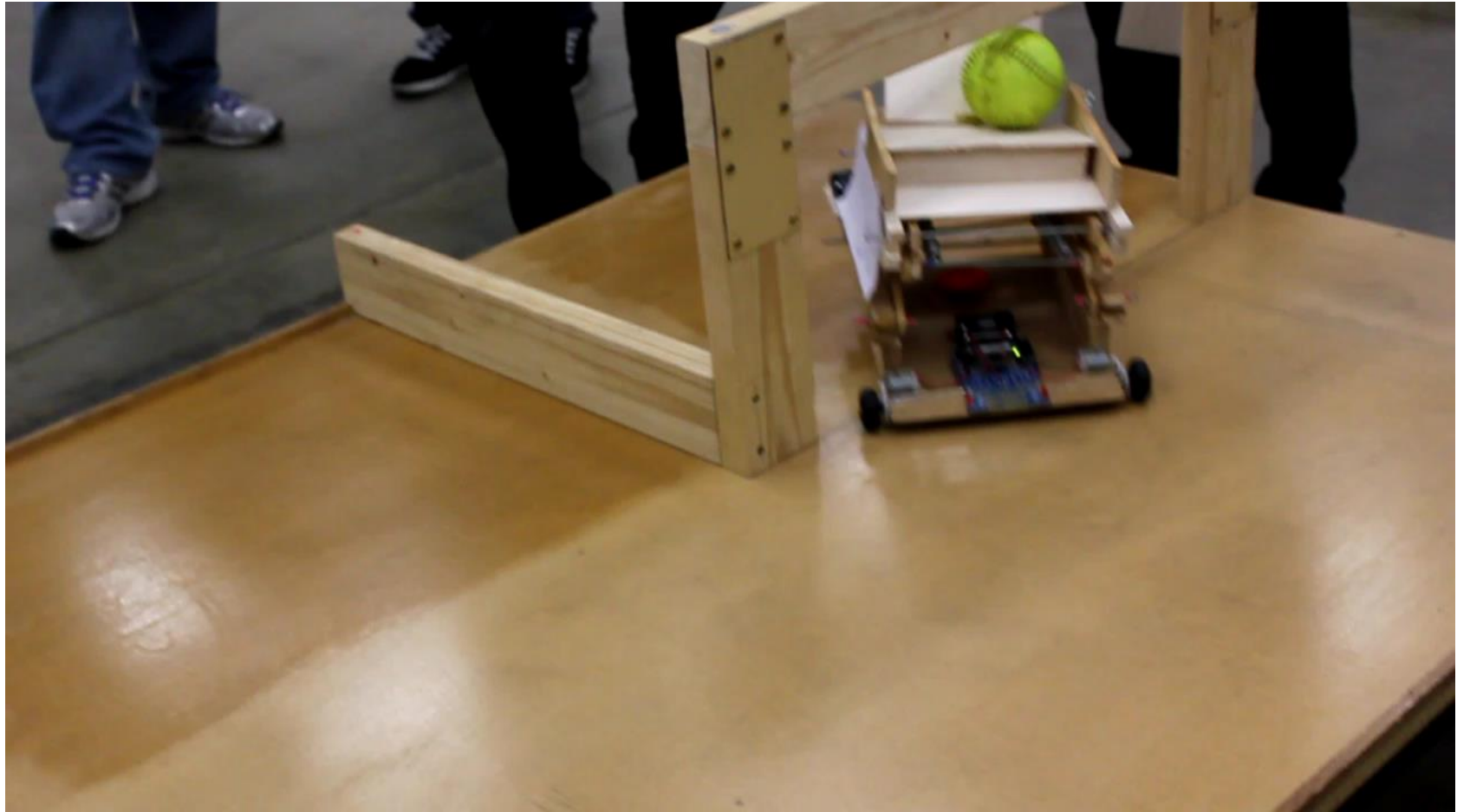
- prototyping
- Testing
- Analysis
- Identifying errors
- Rectify errors (e.g. modify design)
- Testing again

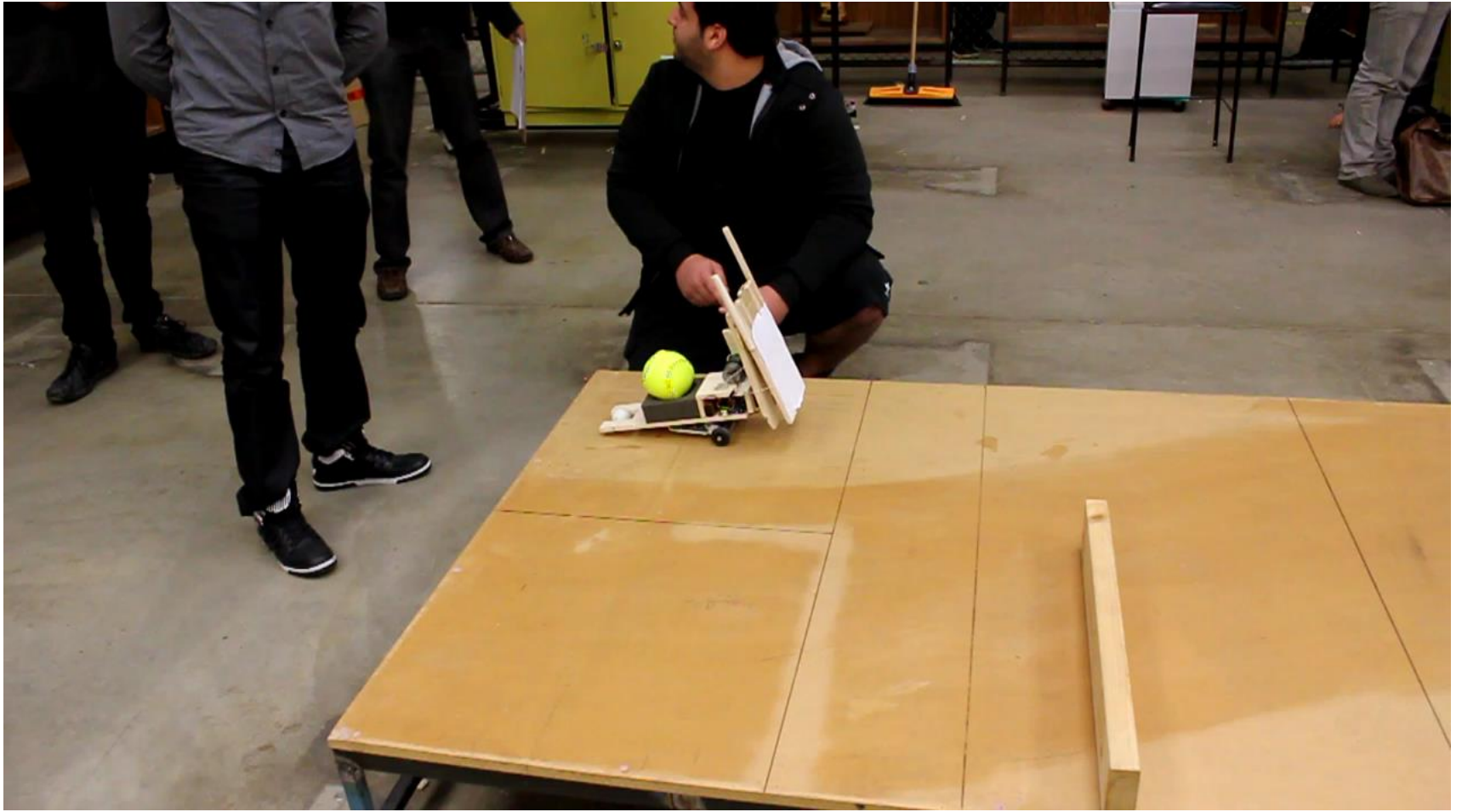
The dilemma or reoccurring problems are resolved by iterations. The number of iterations should be minimum.

It depends on the quality of the above steps taken

Failure of past Warman devices

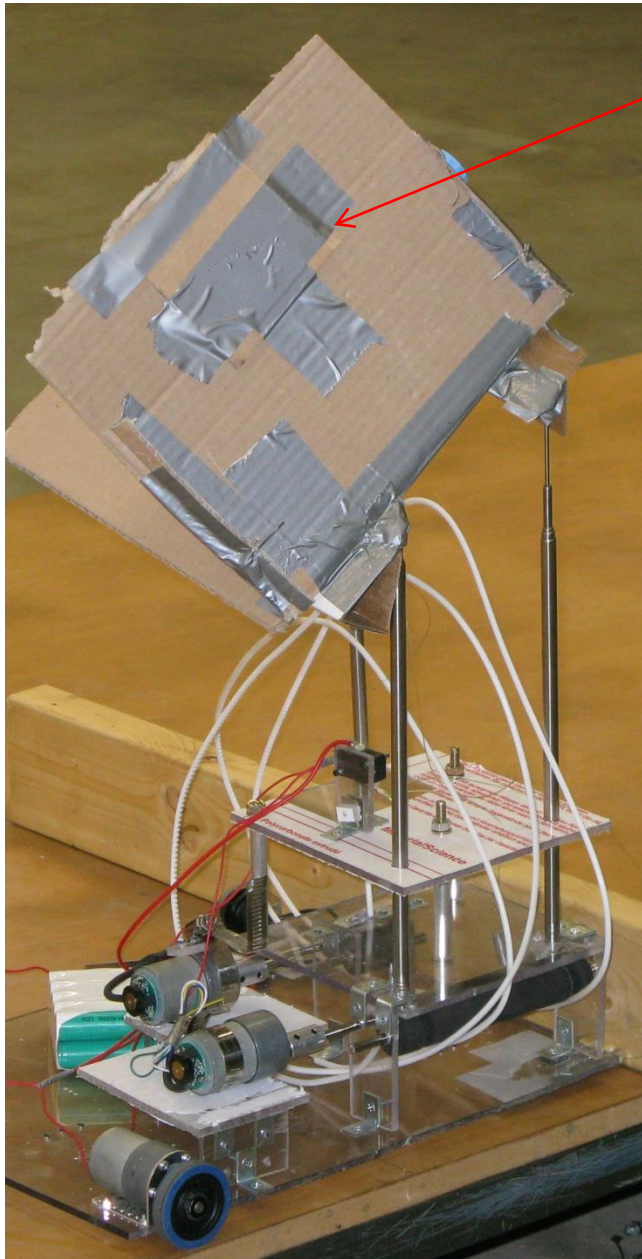




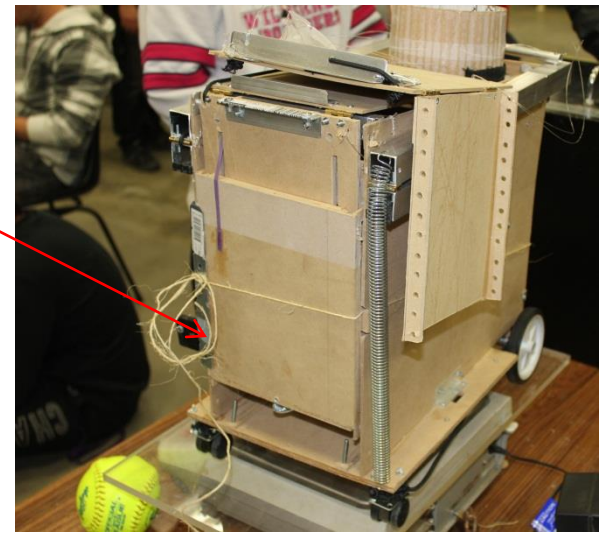


Common issues

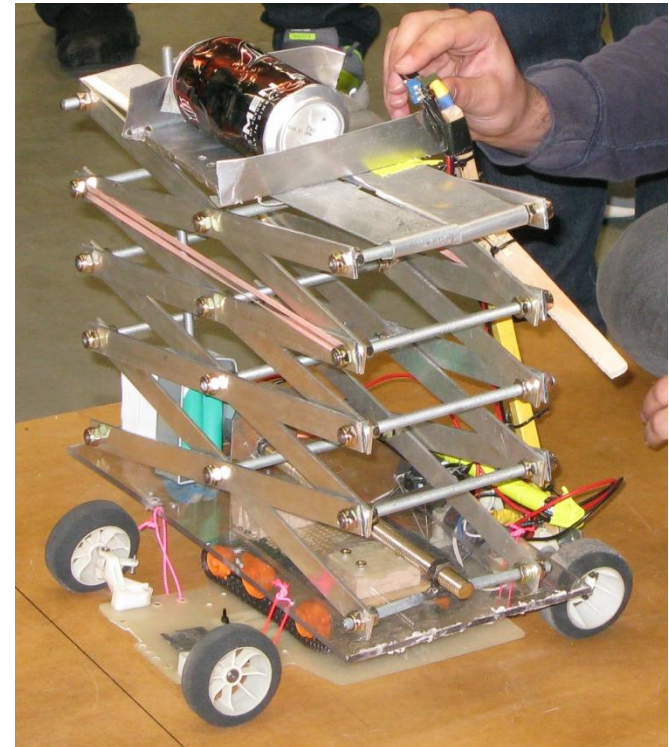
- Incorrect positioning in start zone
- Deviation of device path
- Lack of wheel gripping
- Loose assembly of wheels, axles, gears and motors, and others
- Errors in micro-controller programming
- Over-speed – hence inertial effect
- Imbalance of device
- Incorrect path planning (navigation) – time & speed
- Fault of trigger mechanism – releasing lever

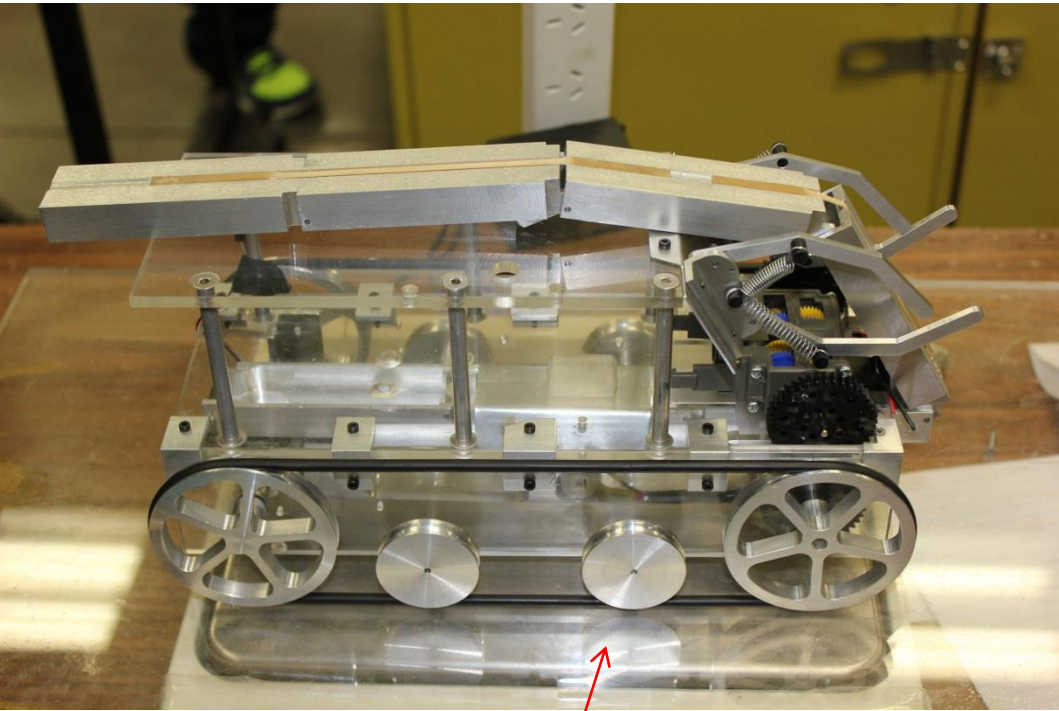


Improper assembly

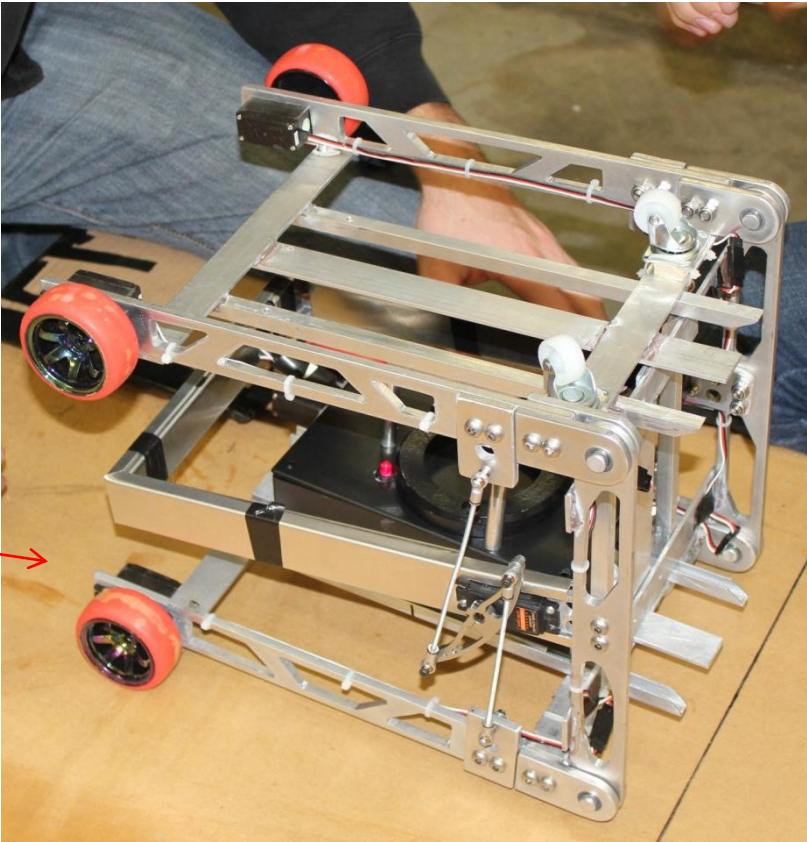


Misaligned wheels and imbalance device





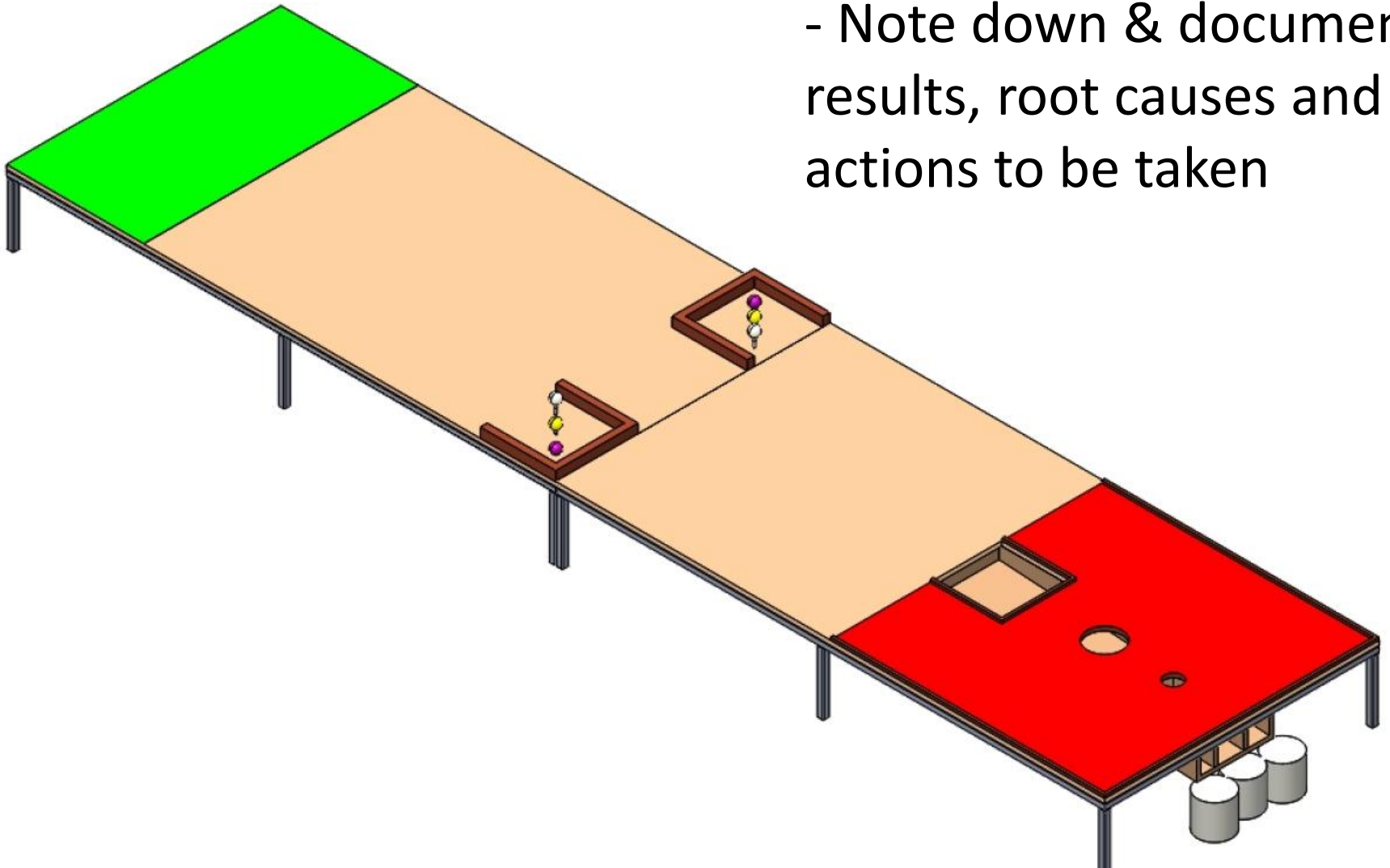
2013 Warman devices



Good and solid assembly of device

Design of testing & tuning strategies

- Plan testing procedure
- Note down & document results, root causes and actions to be taken



Function	Test 1	Test 2	Test 3
Device leaves start zone	Note results/issues here, e.g. wheel locked		
Device navigates Track 1			
Device deploys ball picking mechanism			
Device stores balls			
Device navigates Track 2			
Device delivers balls through hole			

Function	Summary of tests	Analysis	Potential solutions
Device leaves start zone	Note results/issues here, e.g. bracket failure	Wrong loading direction	Joints need to be lubricated or less joints
Device navigates Track 1			
Device deploys ball picking mechanism			
Device stores balls			
Device navigates Track 2			
Device delivers balls through hole			

Summary of testing & tuning

Parts/components	Errors/mistakes	How to solve	Success/fail
Wheels are not aligned	Incorrect mounting	Remount wheels	Success
device moves slower	Battery power drains	Charge battery	Fail

- Key to success
 - Find the root causes
 - Analyse and understand
 - Take corrective actions

Don't ignore even small issues you see in the device

If it is a major design problem – big upset for the team

Minor issues – should be solved by tweaking

Final success – the design meets the set objectives while creativity is highly appreciated

Do your best to achieve the goals!