SCHAEFFLER

Novel Method to Build Real-World Drive Cycle from Data Gathered On Road

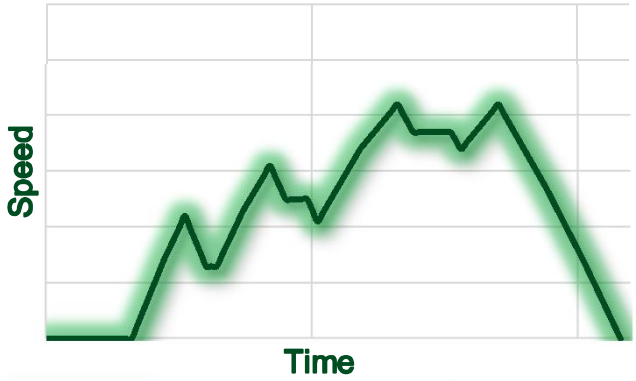
Schaeffler India

LuK INA FAG

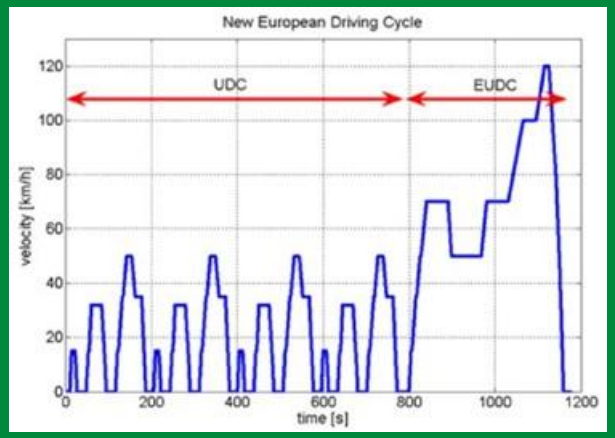
Agenda

1. What is a Drive Cycle?
2. Why Real World Drive Cycle?
3. Process Overview – Methodology, Analysis and Cycle Creation
4. Outcome – Drive Cycle for Pune
5. How MATLAB helped us

What is a Drive Cycle?



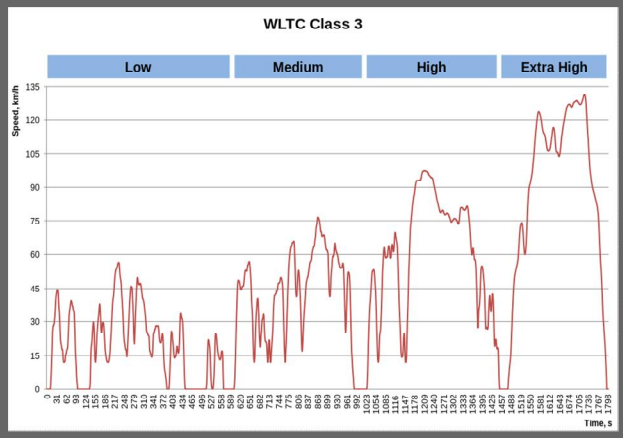
Modular



- Protracted periods at constant speeds.
- Negligible real-world resemblance.

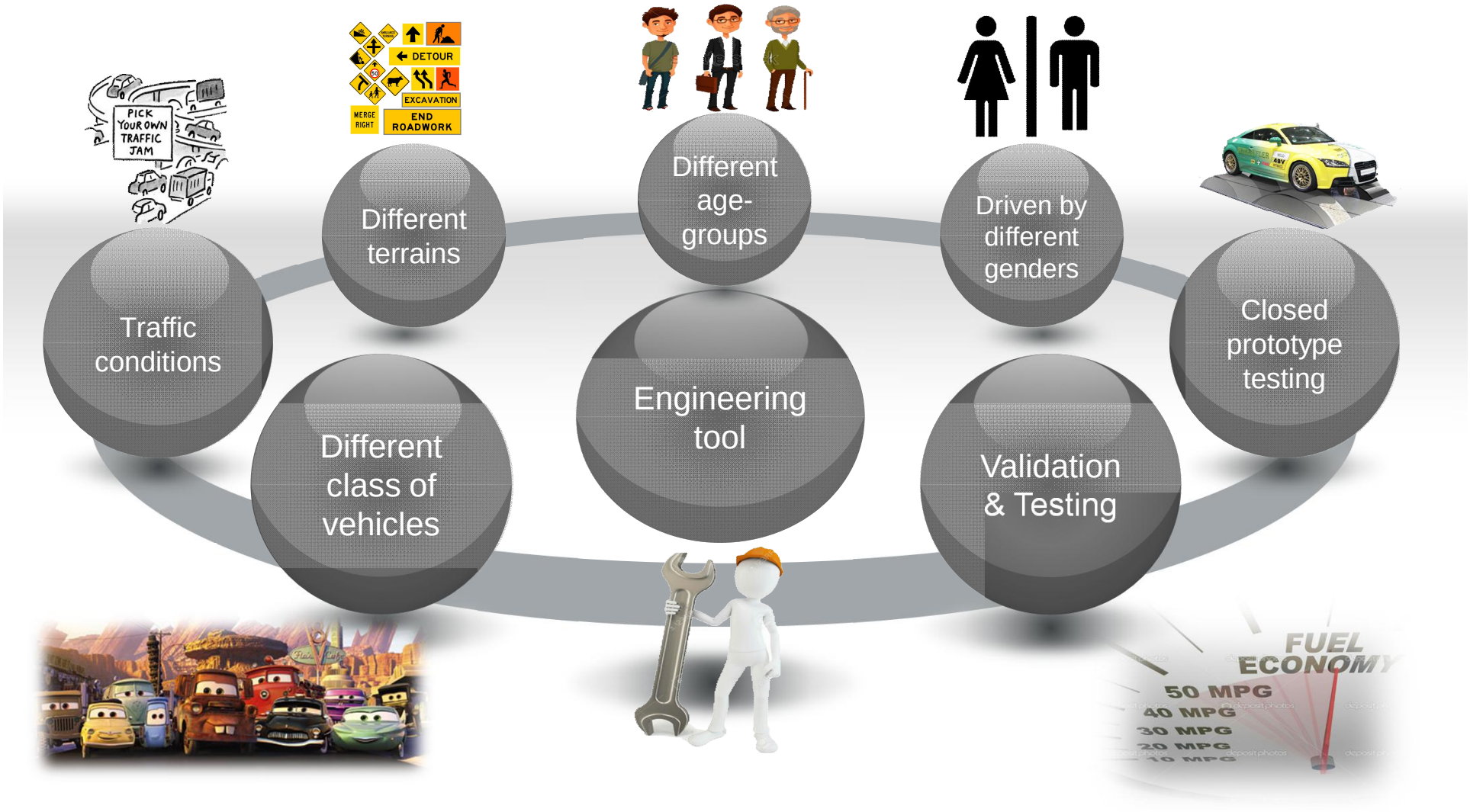
Drive Cycle

Transient



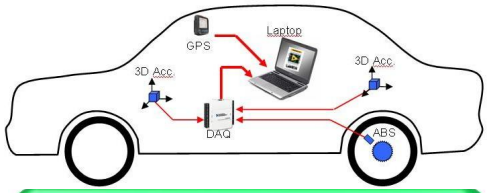
- Continuous speed variations
- Better representation of real-world.

Why Real World Drive Cycle?



Process Overview

Process Definition



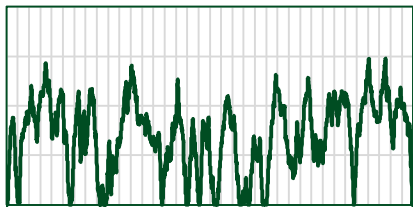
Vehicle Instrumentation

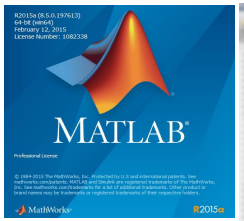
Data Collection

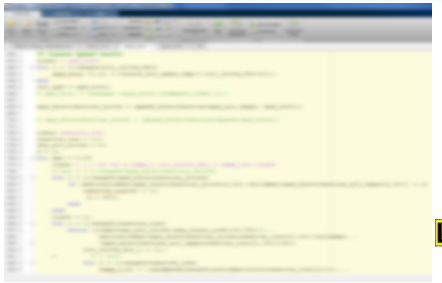
Analysis and Route wise Cycle generation

Complete drive cycle creation

Comparison with real-world data







Process Overview – Process Definition

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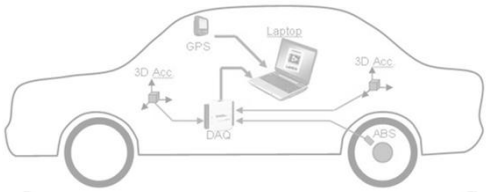

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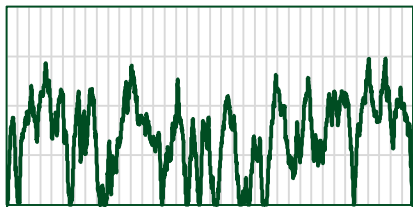
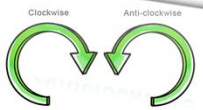


Process Overview – Process Definition

Methodology

3 days Clockwise and 3 days Anticlockwise

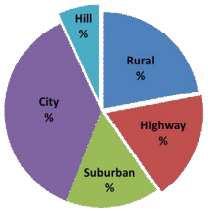


Different time of the day (morning, afternoon, evening)

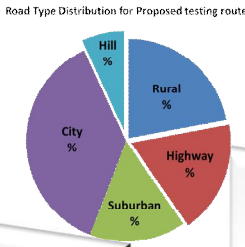
3 times each in "D" Mode and "M" Mode

Chase Vehicle Technique

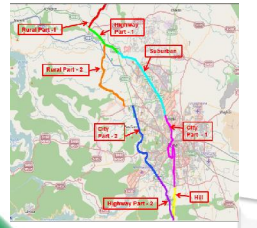
Obtain Route utilization data (City, Highway, Hill, etc.) For typical Indian City



Define Route for testing which includes all terrain types

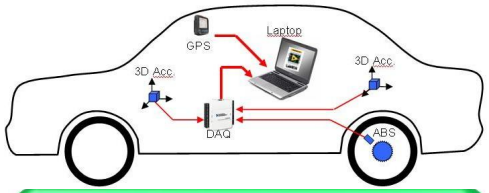


Compare with typical usage data and arrive at the final route



Route

Vehicle Instrumentation



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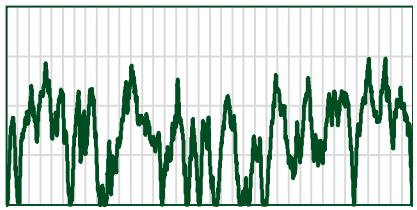

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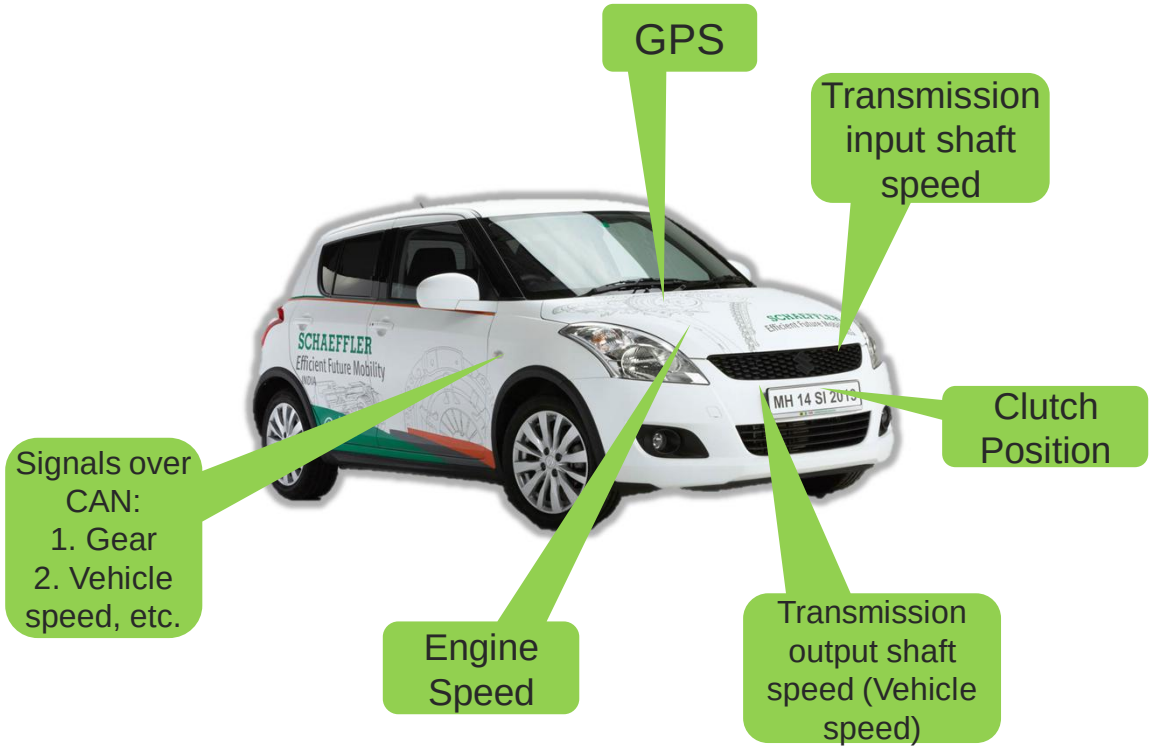

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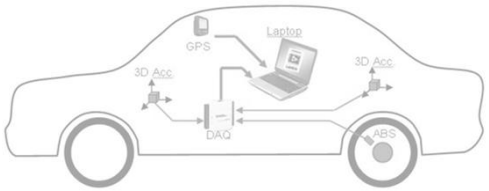

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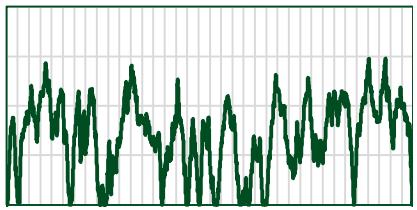

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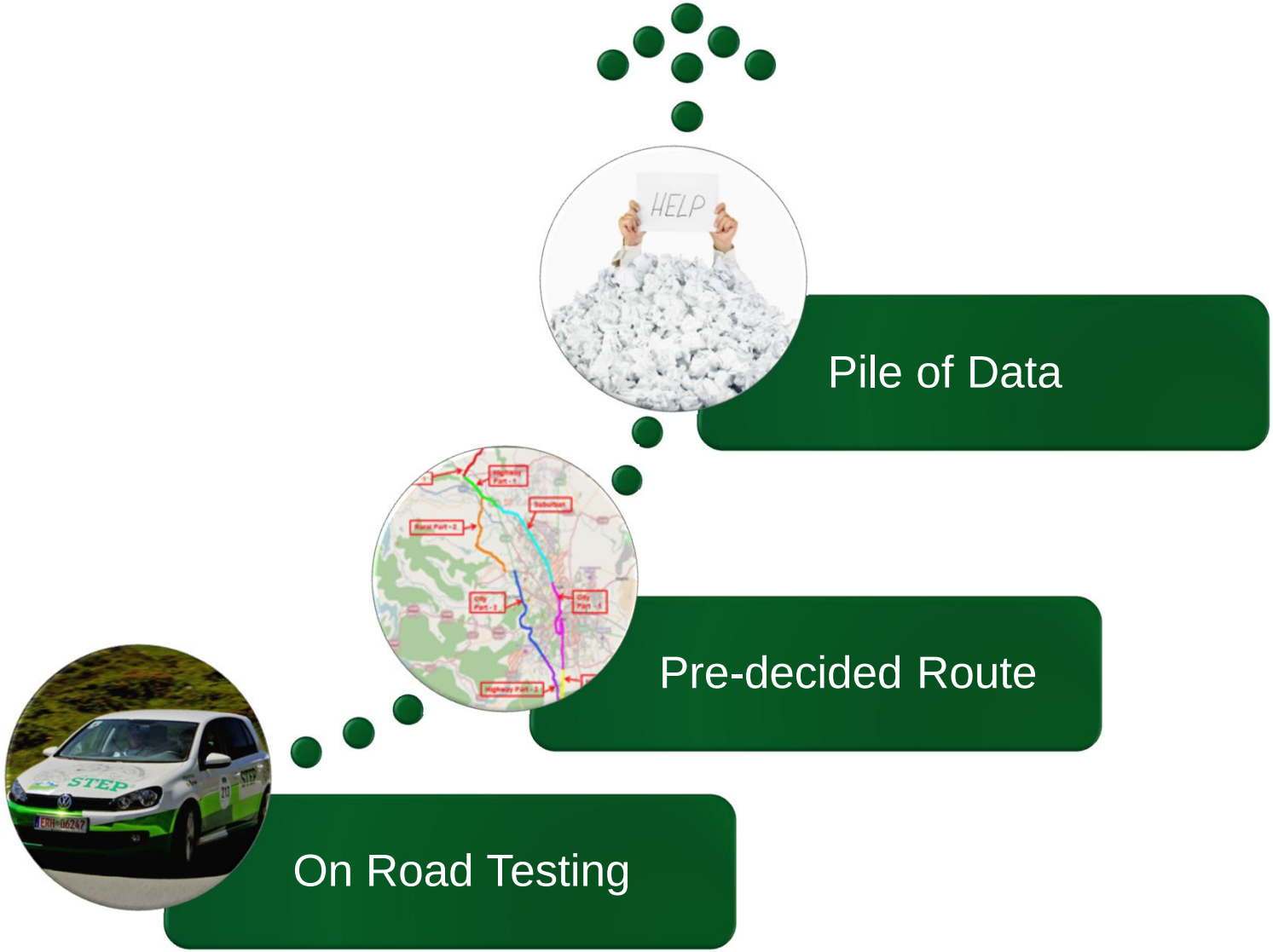

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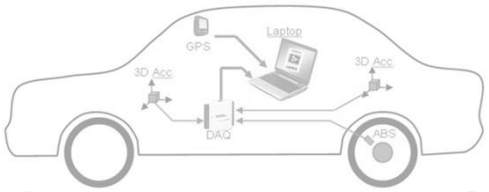

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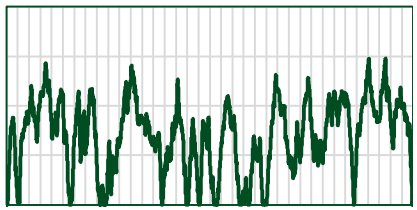
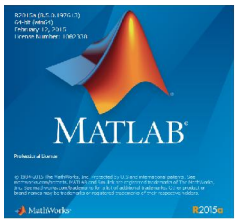
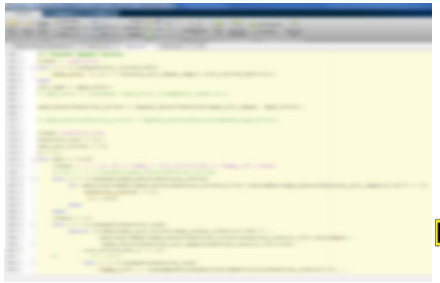






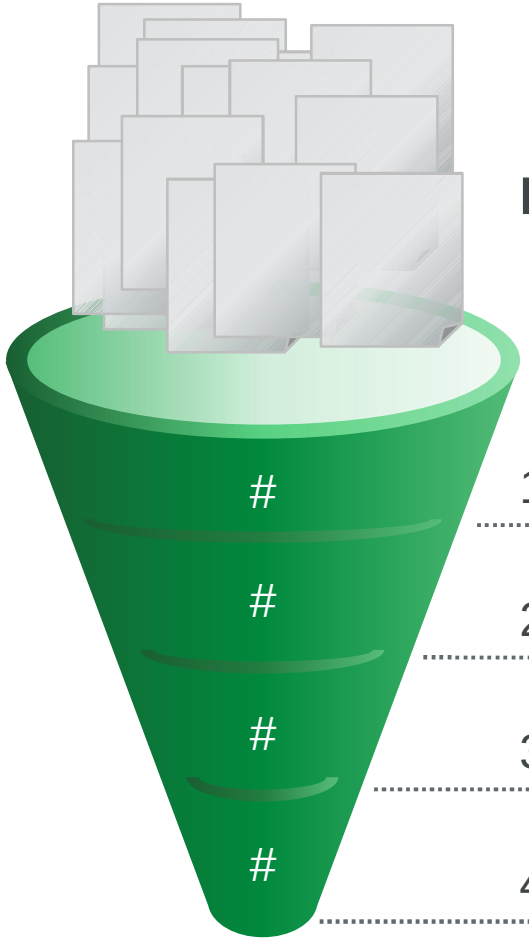
Challenges

Long Analysis Time

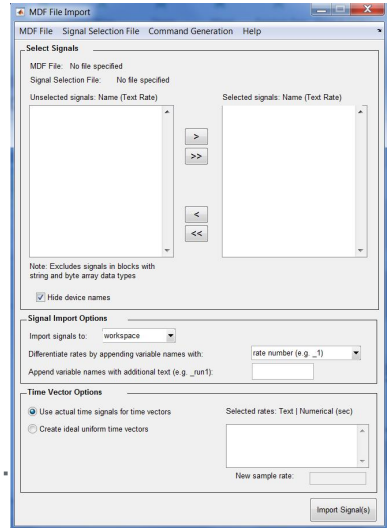
Large Quantity of data

High Probability of human error

Data Pre-processing using MATLAB



Daywise Data



1. Obtain Routewise data
2. Edit Data - omit unplanned stops
3. Obtain Speed vector @1s
4. Data Analysis

Data Analysis – Part 1

Decide total cycle time

Determine Phase Distribution – Acceleration, cruising, idling, deceleration

Calculate reference parameters

- Min, Max & Avg speed; SAFD
- Speed distribution (0-10, 10-20 …)

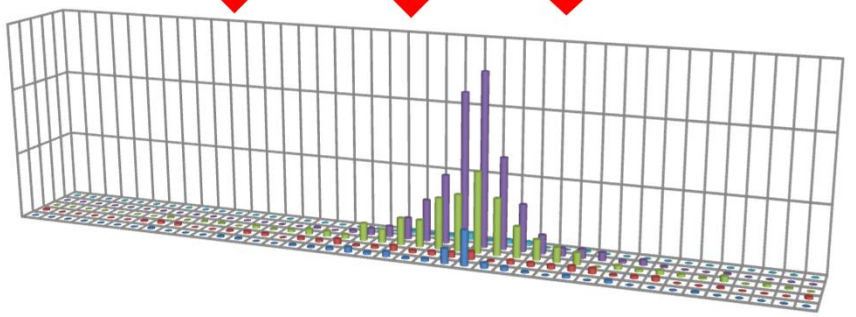
Calculate reference parameters

- RMS Acceleration

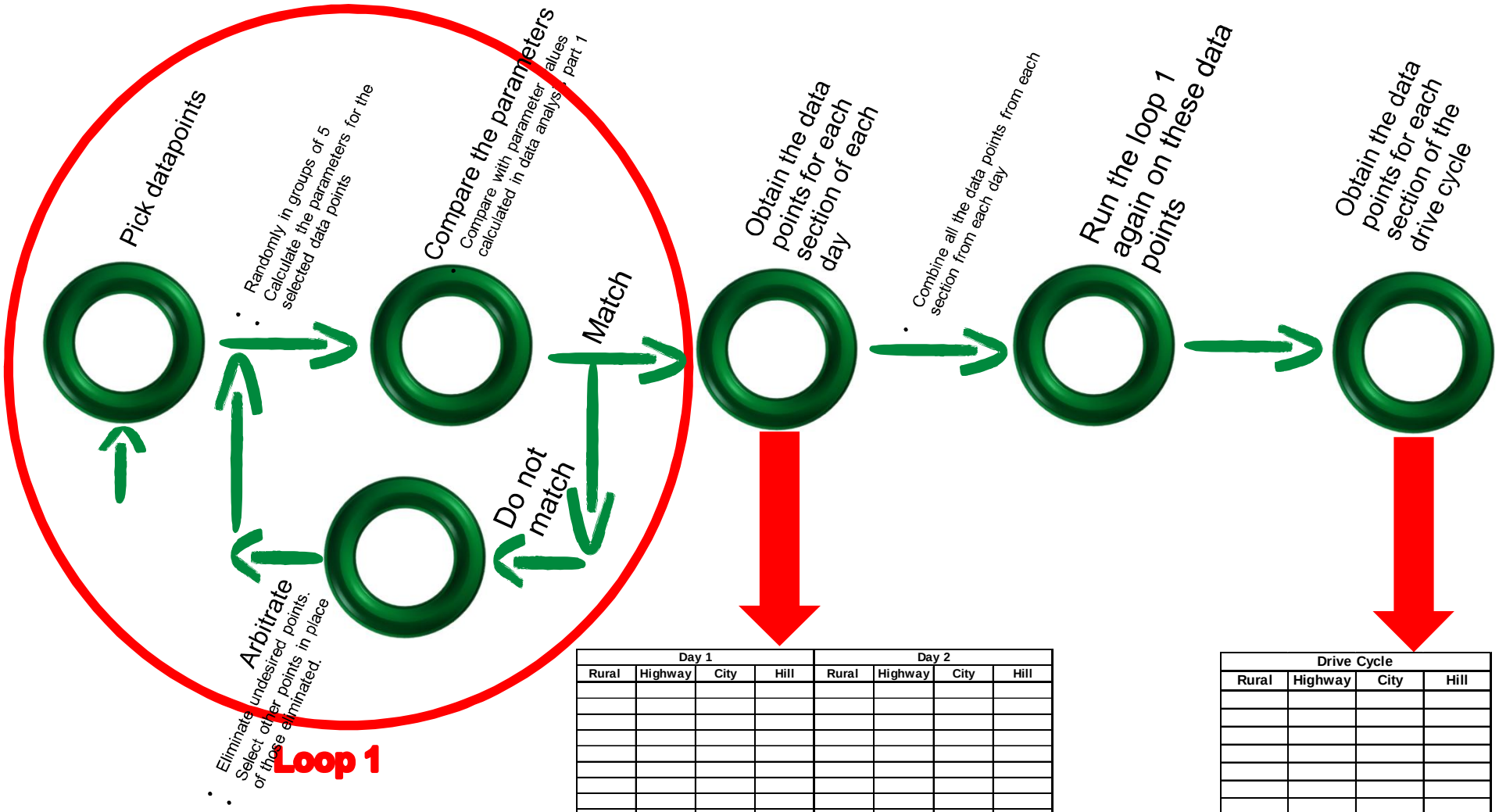
	No. of Points	Percentage
Idling	1797	13.7
Acceleration	4880	37.2
Deceleration	4444	33.8
Cruising	2009	15.3
Total	13130	100

All days Average	
Idling	14.5
Acceleration	38.1
Deceleration	33.3
Cruising	14.2

	No. of Points	Percentage
Idling	2011	15.4
Acceleration	4742	36.2
Deceleration	4627	35.3
Cruising	1713	13.1
Total	13093	100



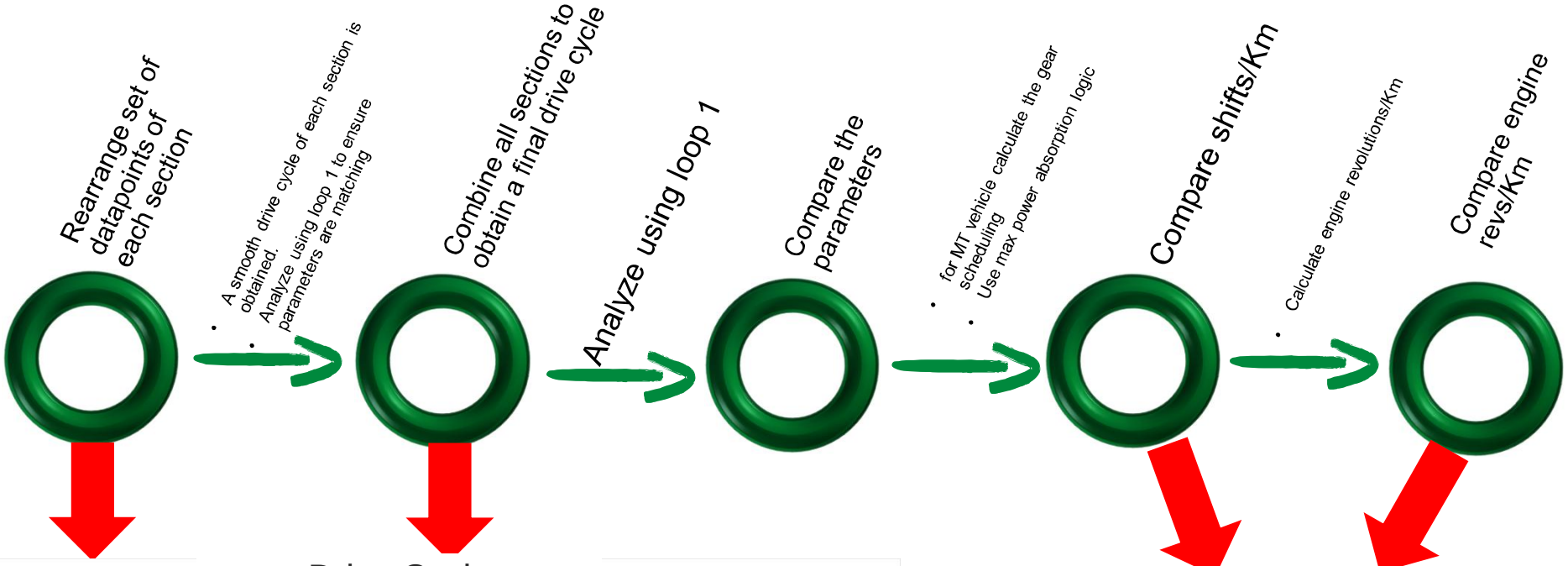
Data Analysis – Creating Data Points for Each Section

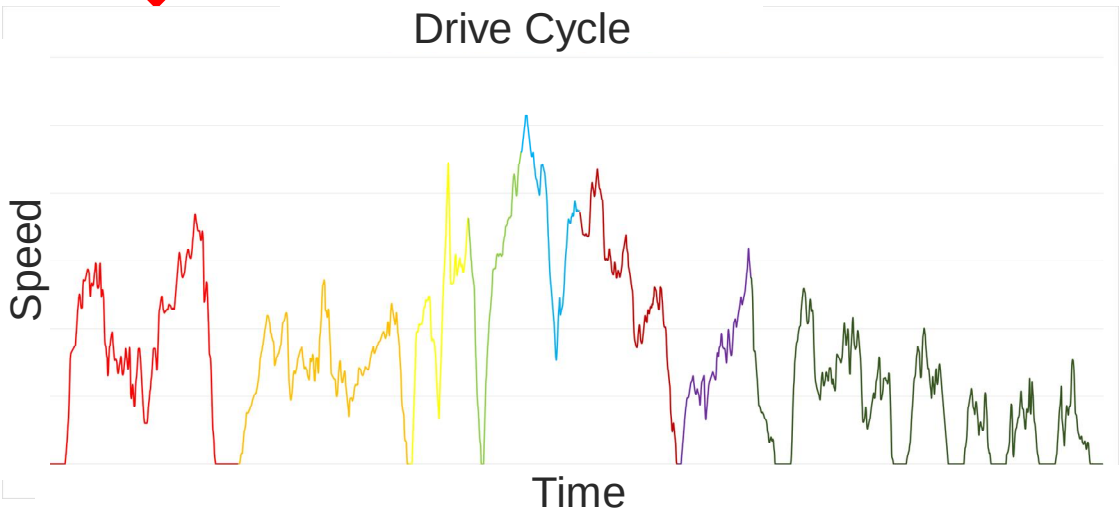


Day 1				Day 2			
Rural	Highway	City	Hill	Rural	Highway	City	Hill

Drive Cycle			
Rural	Highway	City	Hill

Data Analysis – Creating Final Drive Cycle



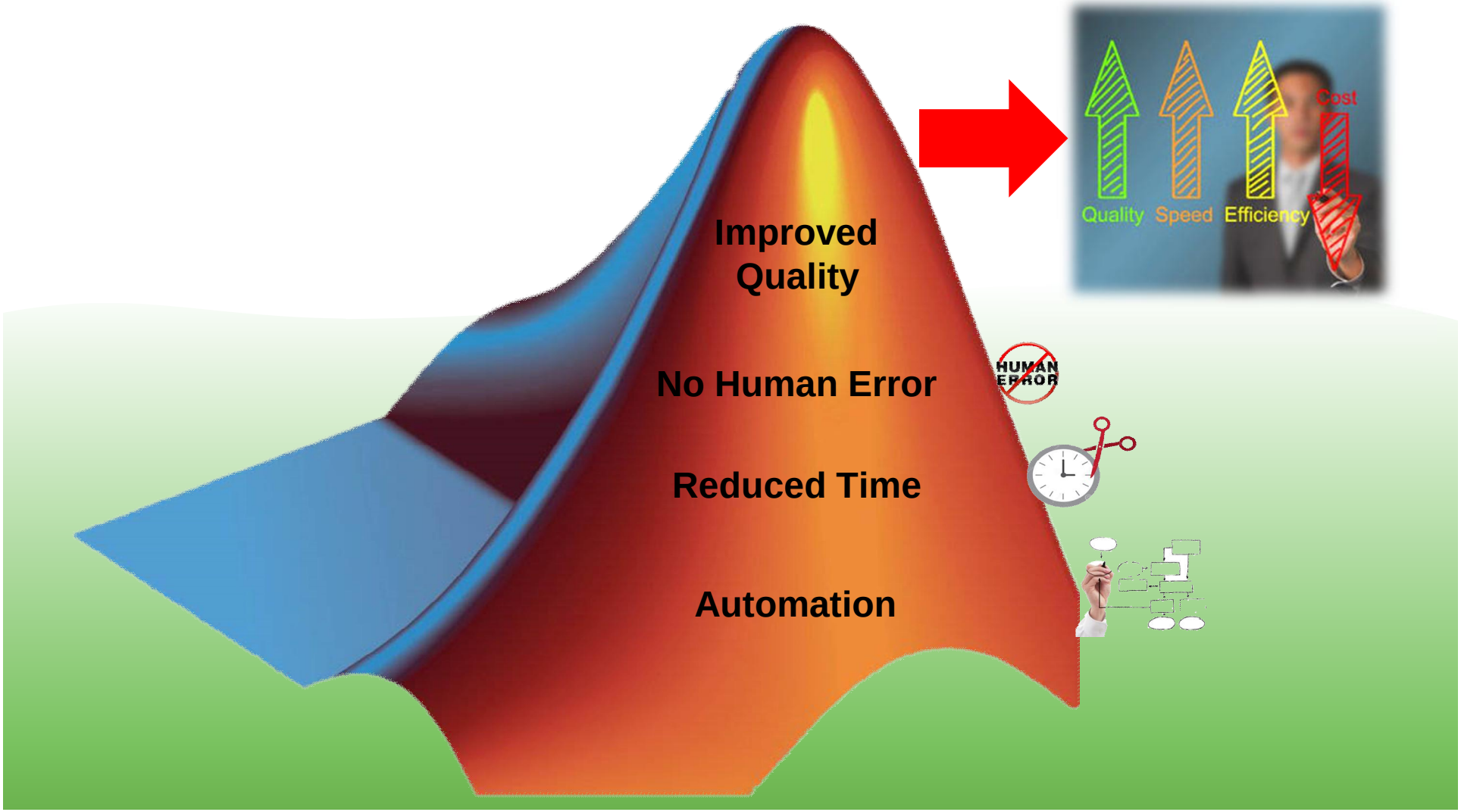


		Total Engine Revolutions
		DC
DC	Rural 1	
	Highway 1	
	Suburban 1	
	City 1	
	Hill 1	
	Highway 2	
	City 2	
	Rural 2	
	Total	0.0

		Engine Revolutions per Kilometer	
		DC	Difference (Real World - DC)
DC	Rural 1		
	Highway 1		
	Suburban 1		
	City 1		
	Hill 1		
	Highway 2		
	City 2		
	Rural 2		

		Shifts/Km		
		DC - Total shifts	DC	Difference (Real World - DC)
DC	Rural 1			
	Highway 1			
	Suburban 1			
	City 1			
	Hill 1			
	Highway 2			
	City 2			
	Rural 2			

How MATLAB helped us in this complex task?



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Thank You

Together We Move The World

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Questions & Discussions