A Magnetically Coupled Inductive Loop Sensing System for Less-lane Disciplined Traffic

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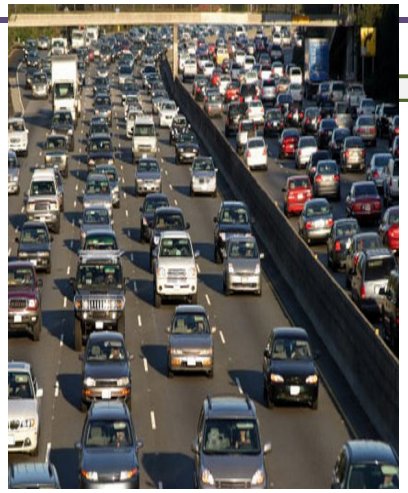
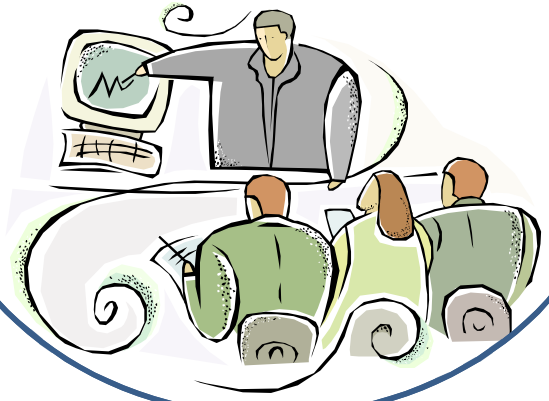
Intelligent Transportation System



Traffic Detector

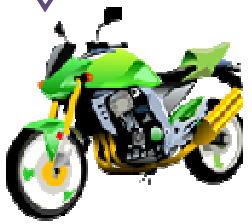
Sends Information

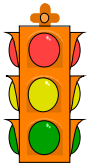
Traffic Control Room



E-Message

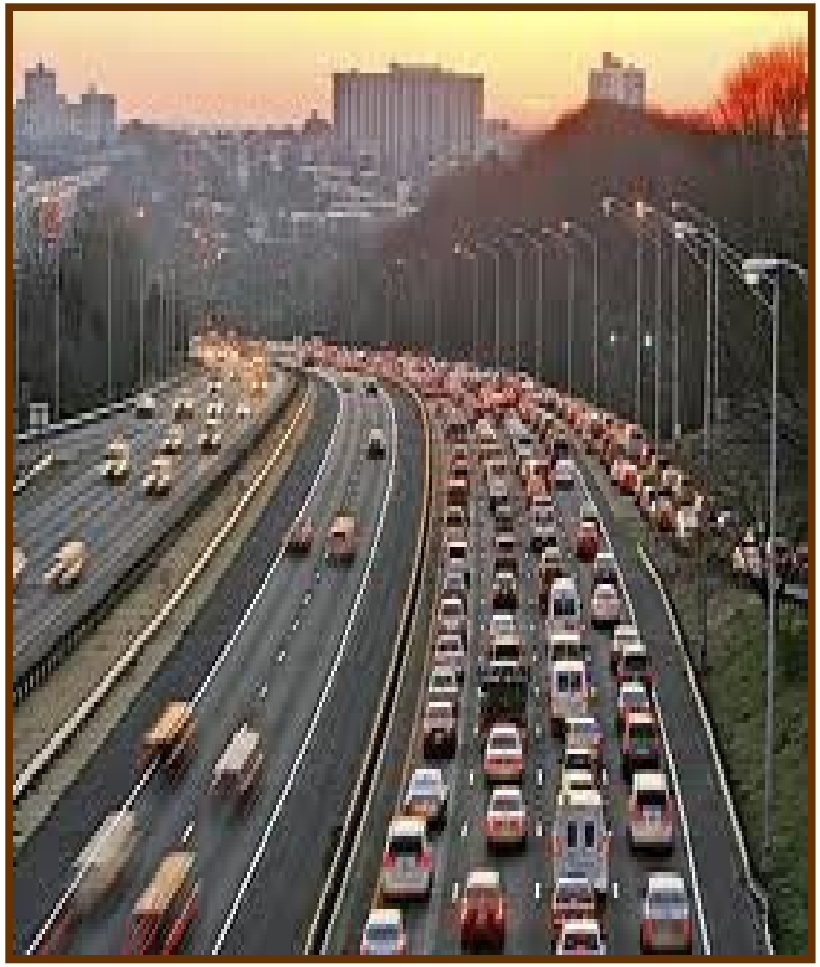
Messages





Traffic Signal Control

Homogeneous and Heterogeneous Traffic



Homogeneous

Heterogeneous

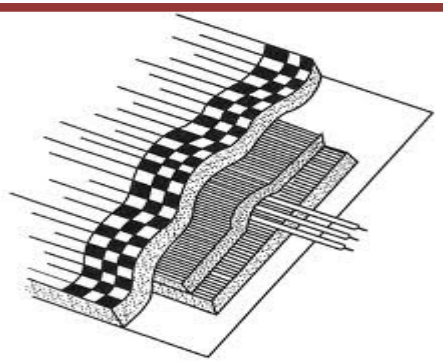
Traffic Detector

- Detect various vehicles reliably
- Categorize as bus, car, motor cycle, bicycle, etc.
- Count
- Measure the speed of the vehicle
- Direction of movement
- Keep the power dissipation low

Heterogeneous

Traffic Flow Sensors

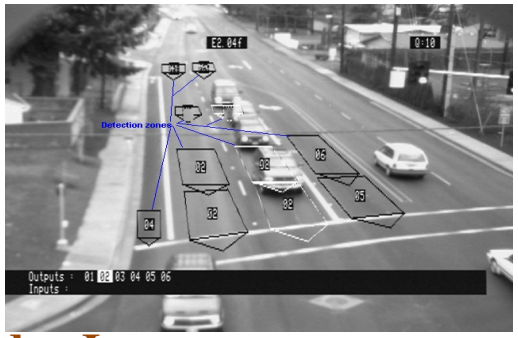
In-roadway Sensors



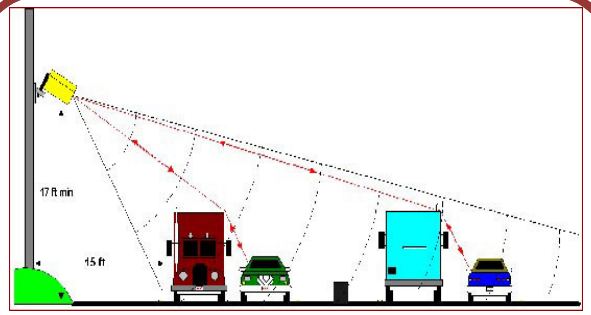
Tape switch-US 4568937, US 4472706

Inductive Loop Detectors
-US4472706, US3571789

Over-roadway Sensors



Video Image-US 7646890, US5535314

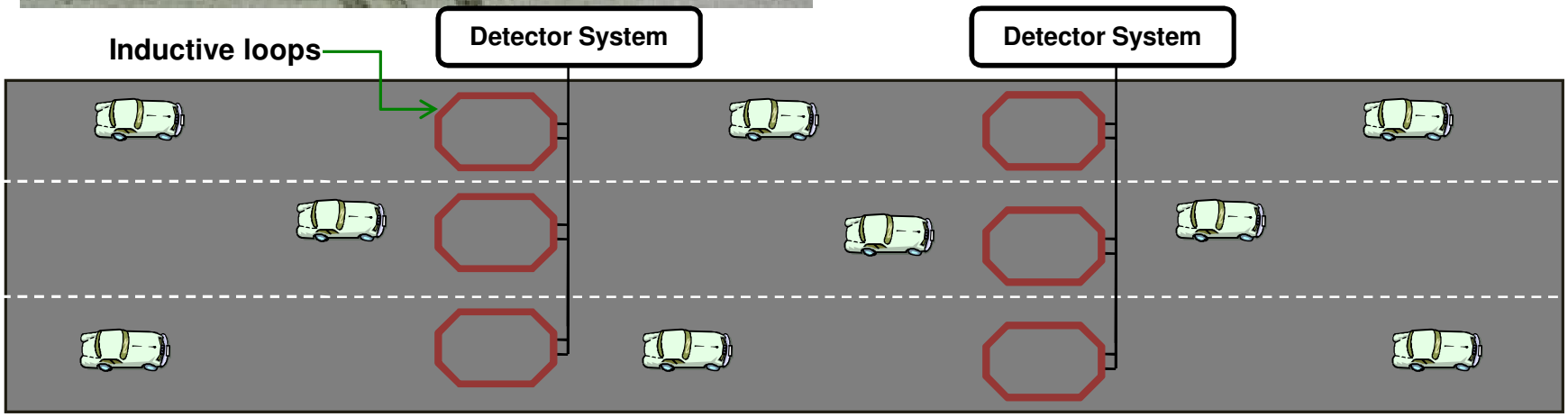


Microwave radar-US5266954, US7439876

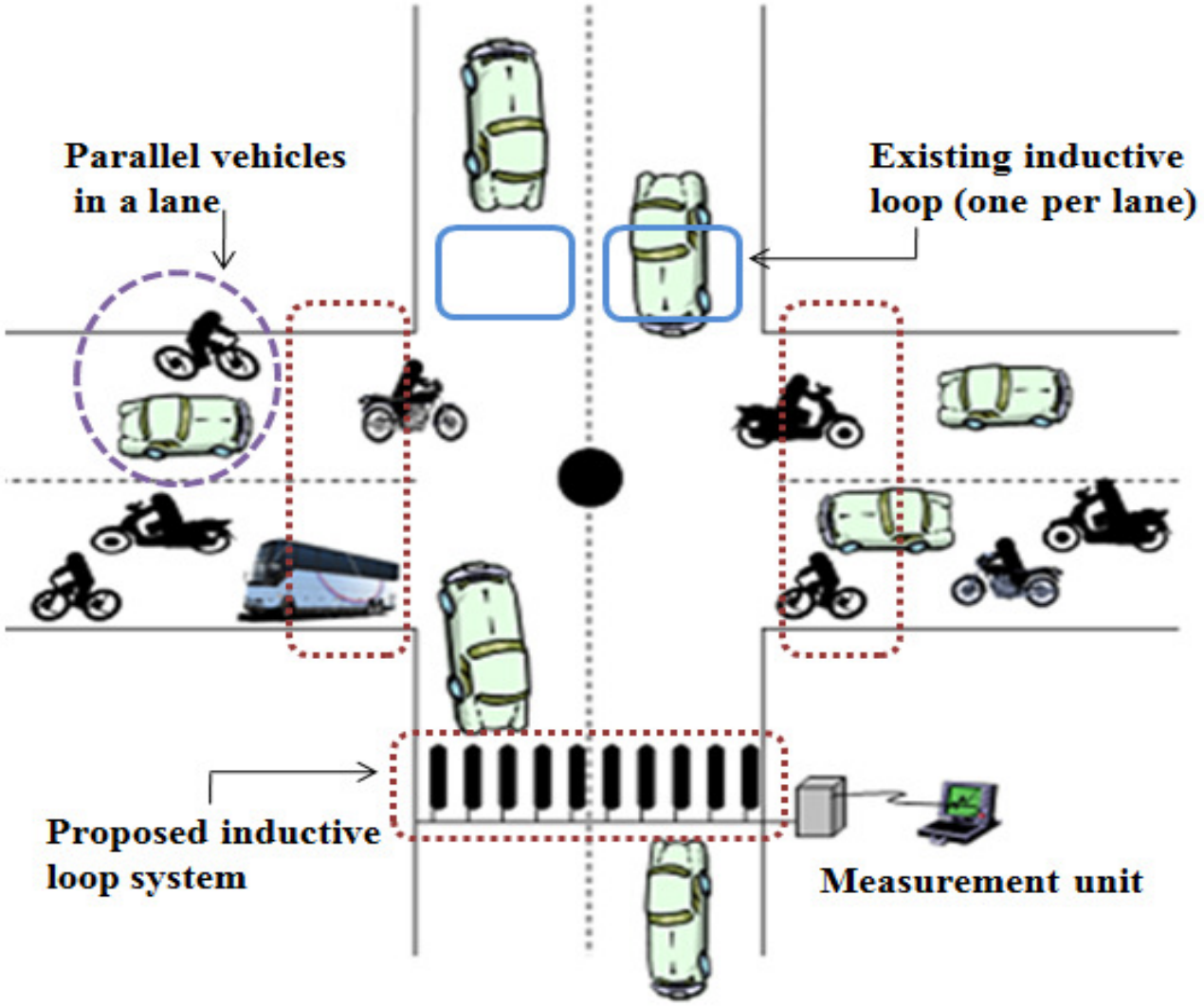
Existing Inductive Loop Detector

suitable only for
lane disciplined and homogeneous traffic

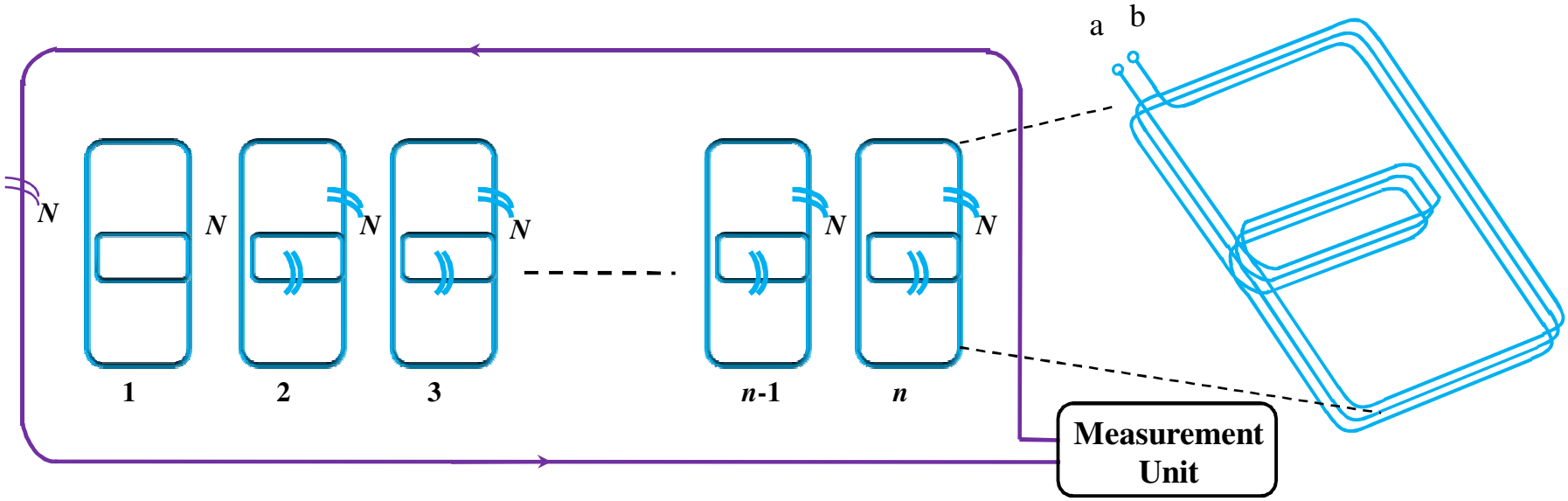
Inductive loops are placed inside a Saw cut made in the road



The Proposed Inductive Loop Detector

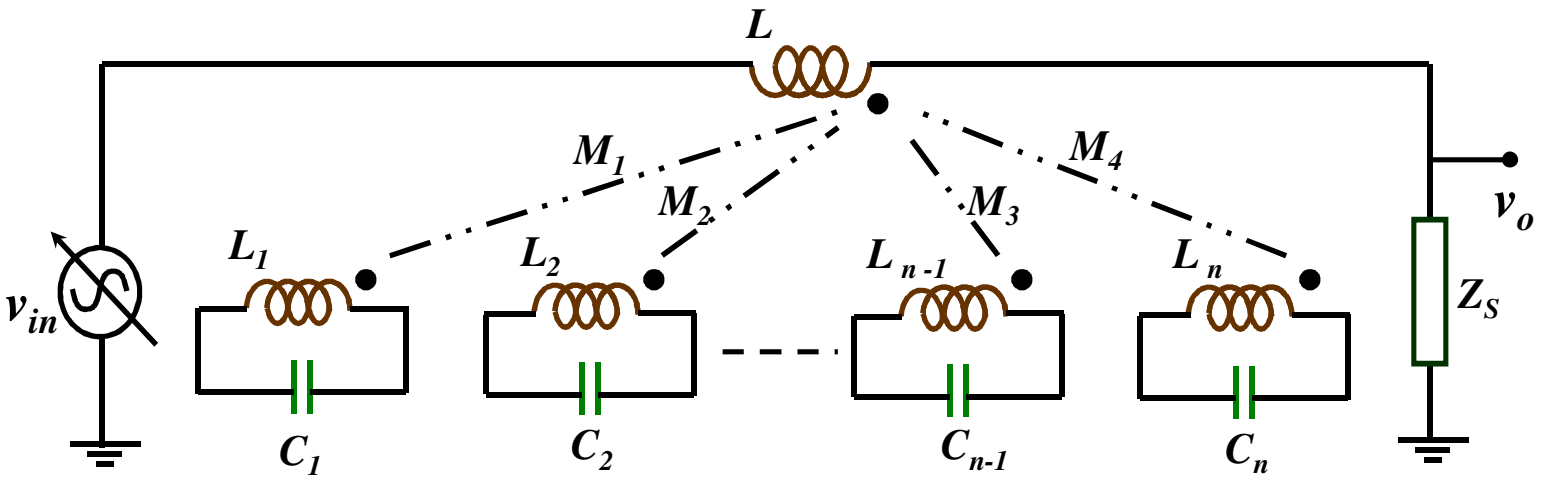


Magnetically Coupled Inductive loops



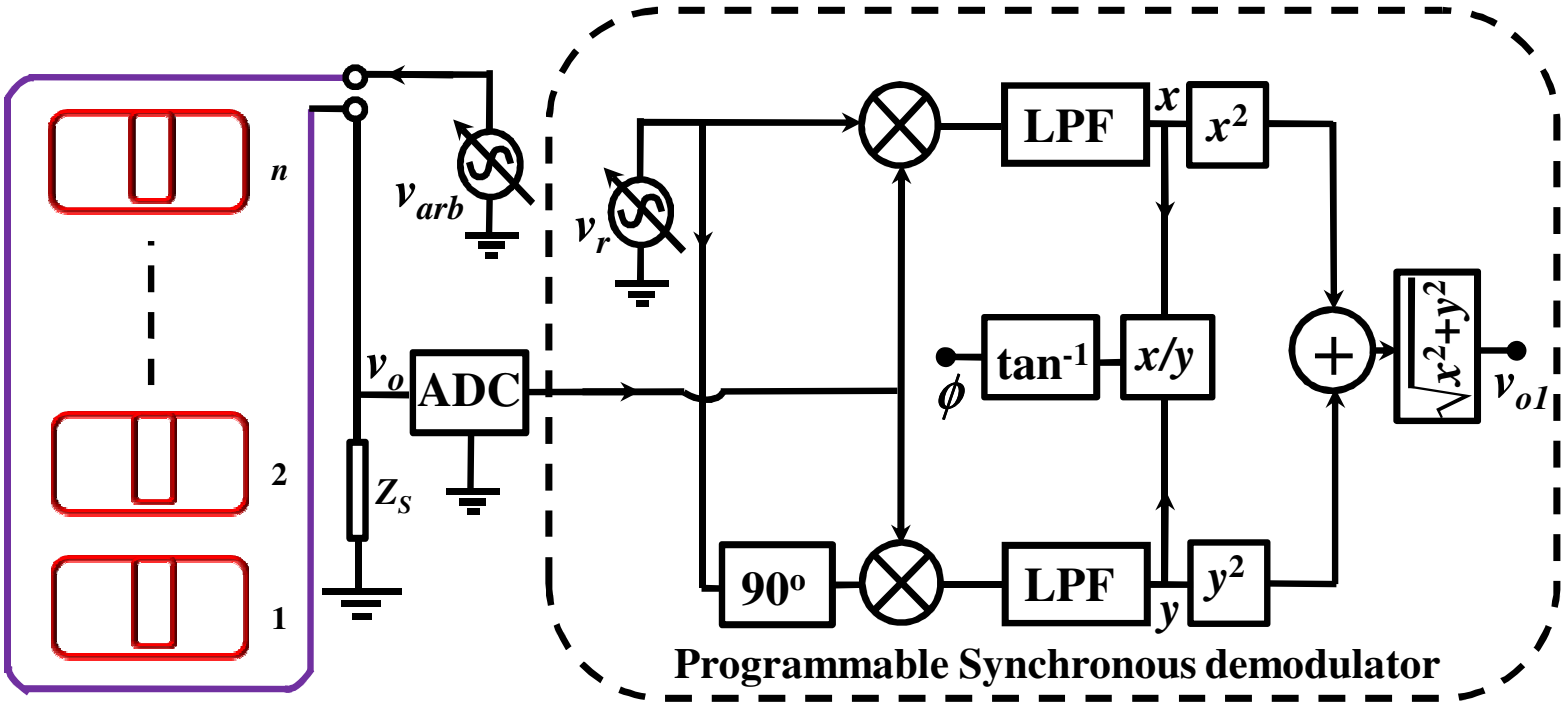
Mutually coupled inductive loop detector with the multiple inner loop (1, 2, …*n*) and a single outer loop. All the inner loops are identical and a pictorial view of the loop employed is shown right side.

Electrical equivalent circuit



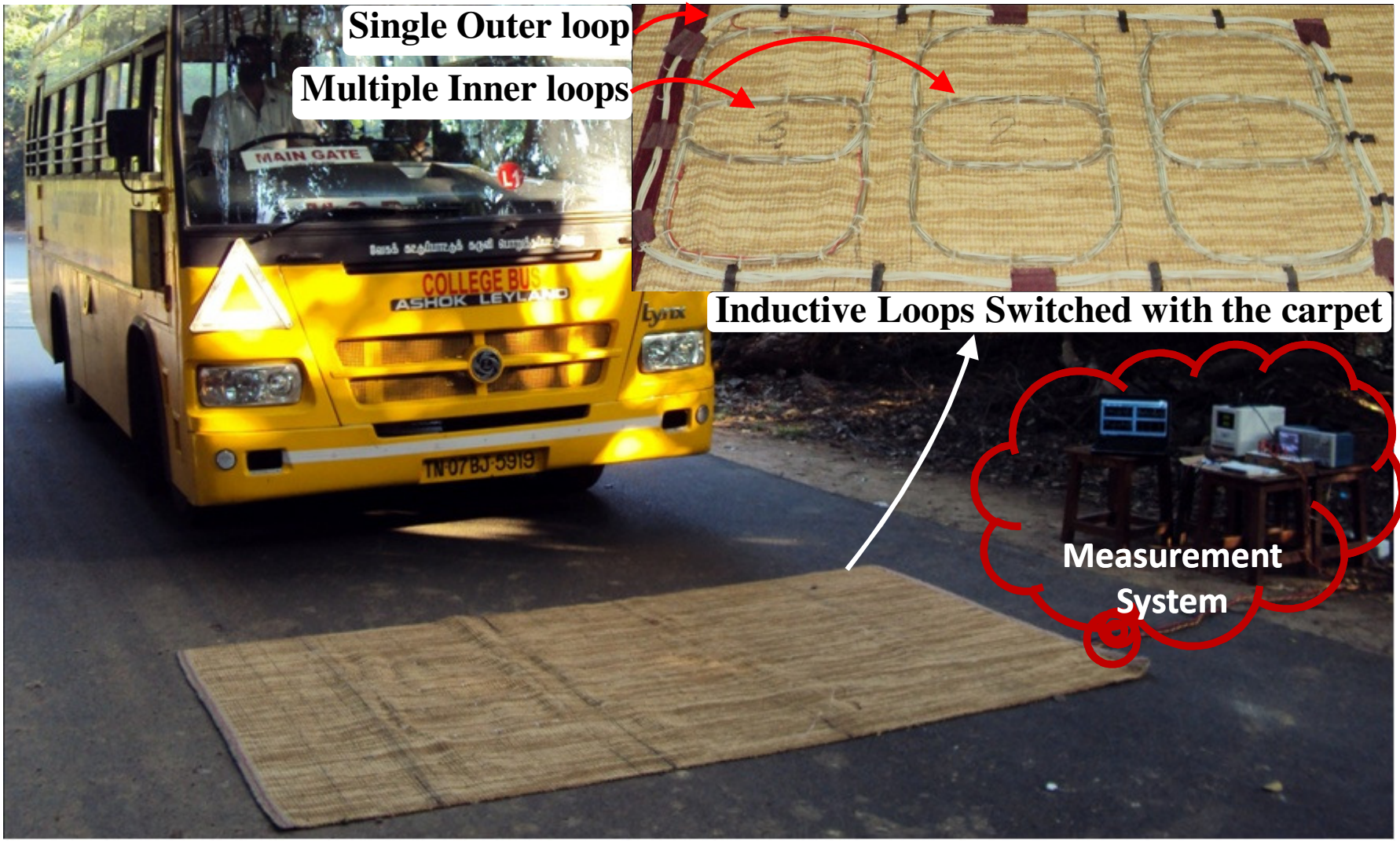
Magnetically-coupled inductive loop system

The Measurement Scheme Employed for the Magnetically Coupled Inductive Loops

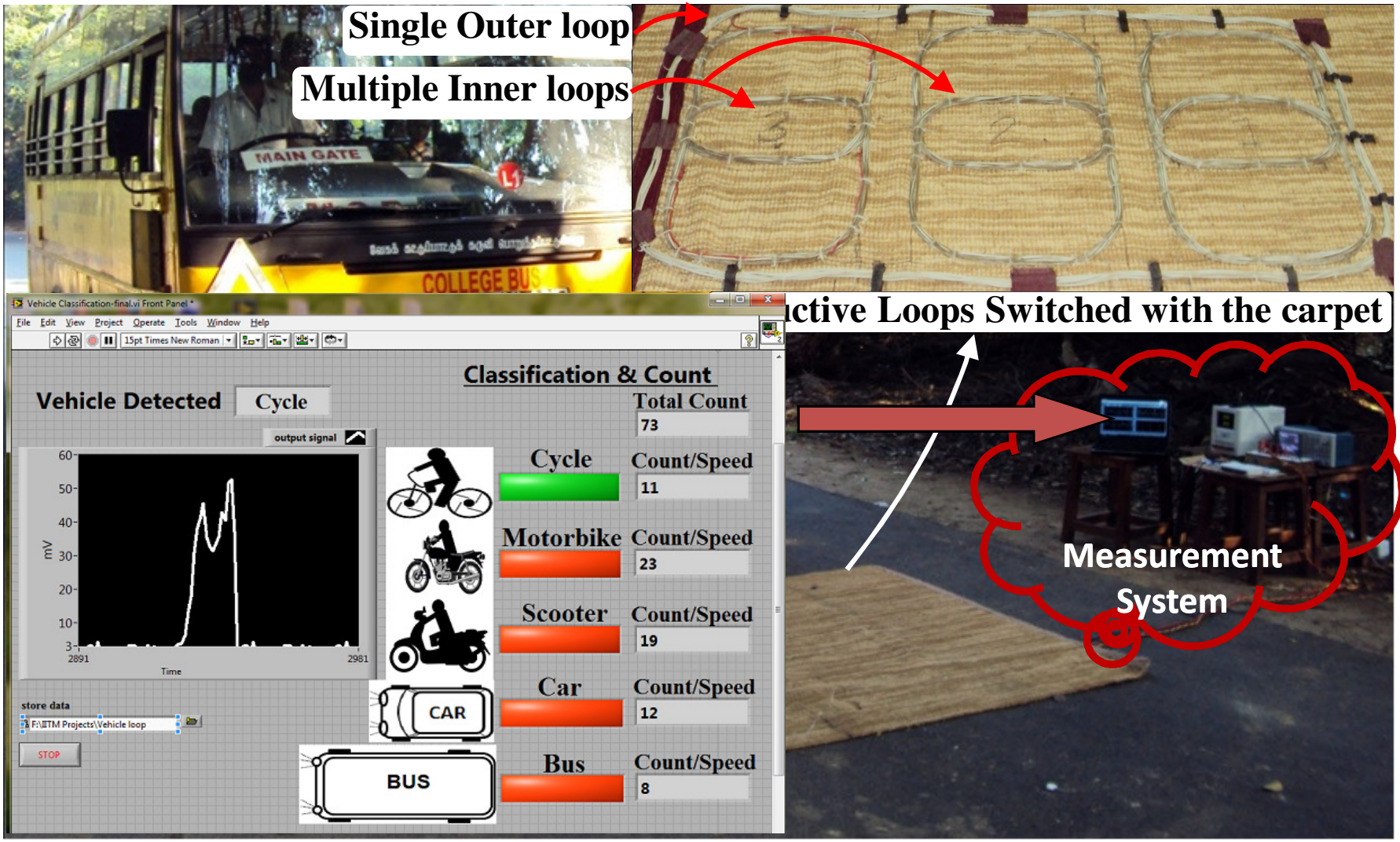


$$v_{arb} = v_m(sin2\pi f_{p1}t + sin2\pi f_{p2}t +, \ldots + sin2\pi f_{pn}t).$$

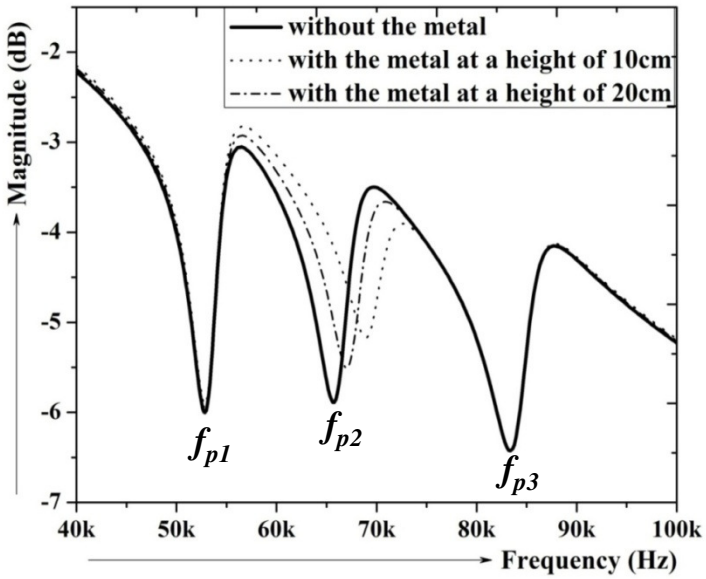
Experimental Setup and Results



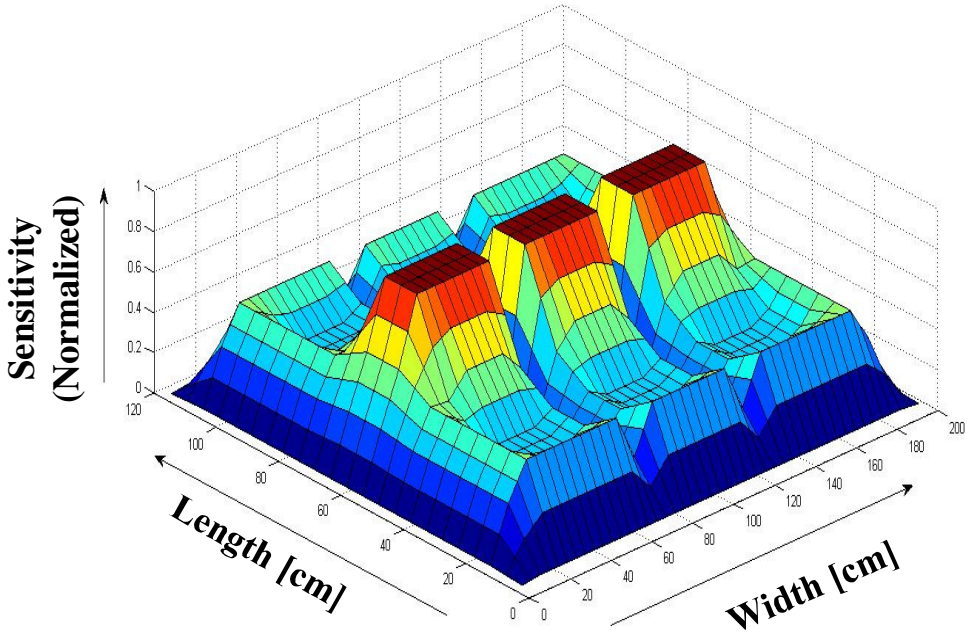
Experimental Setup and Results



Results of the Sensitivity and Resonance Frequency shift Test

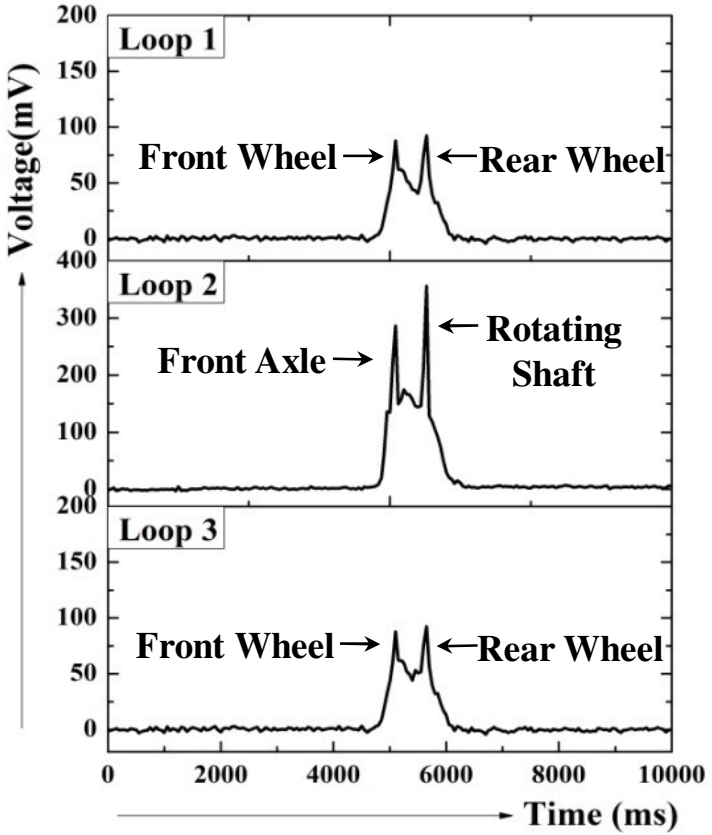


The parallel resonance **frequency shift** in the presence of a conductive/metallic object

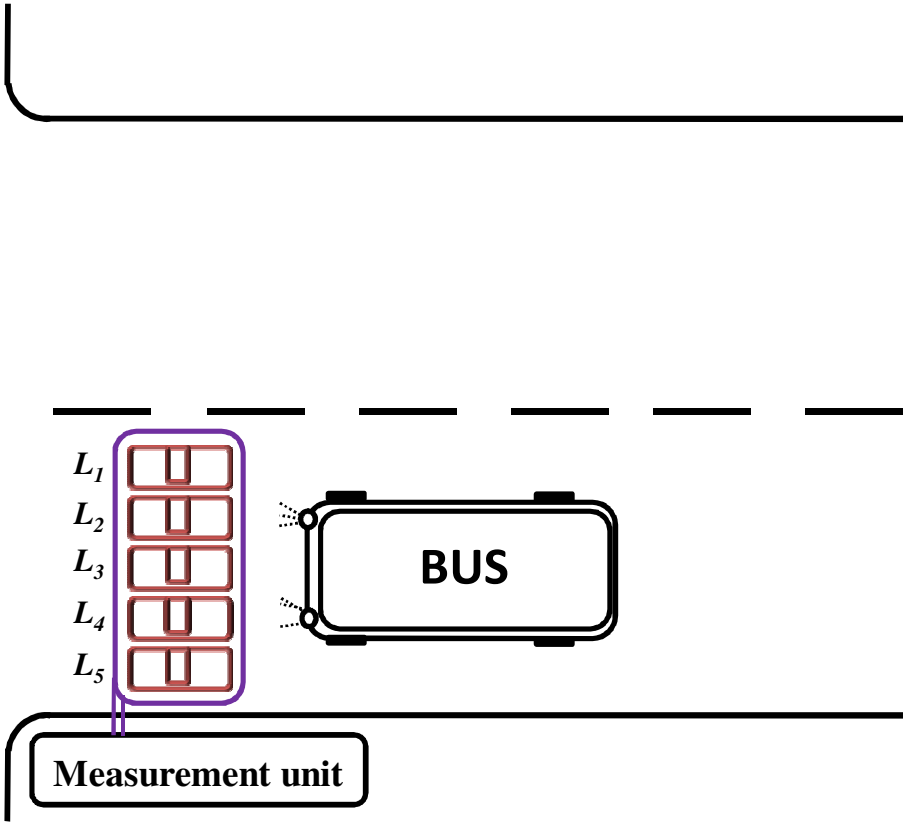


Sensitivity test

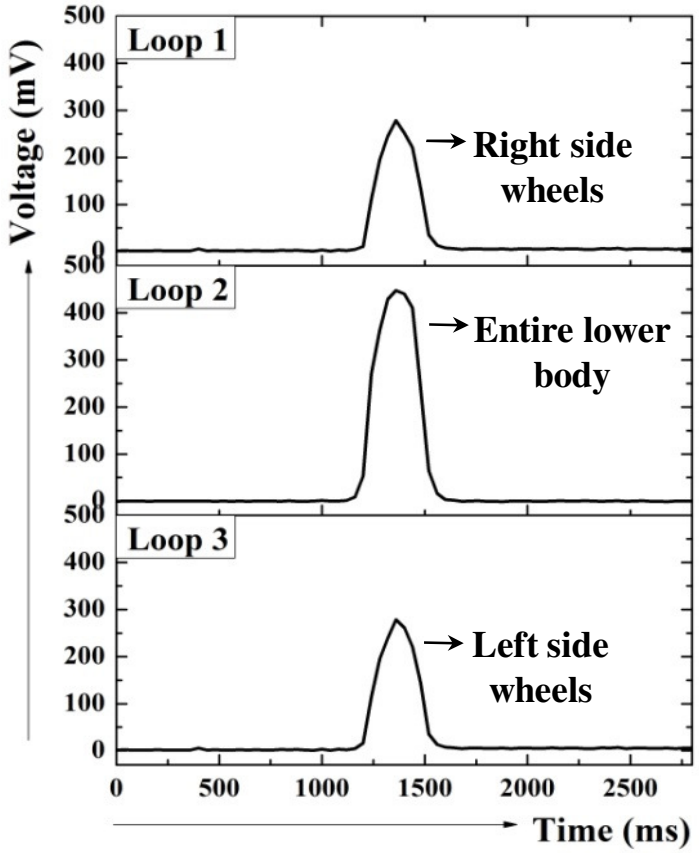
Results from the Mutually Coupled Multiple Loop Detector



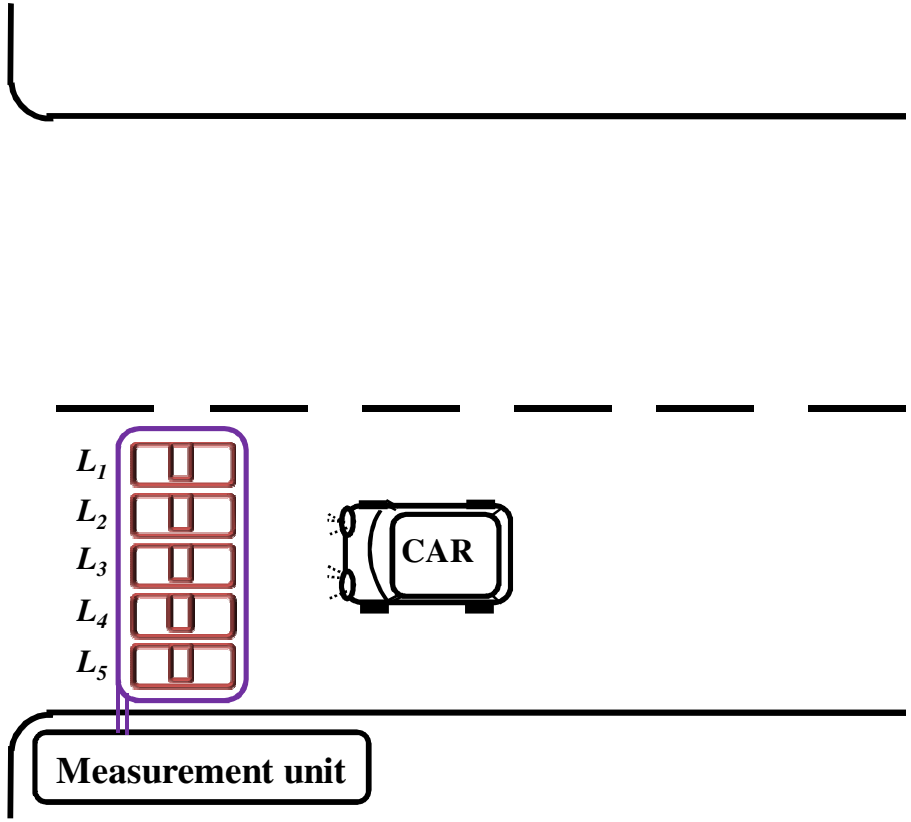
Signature of a bus obtained from multi-loop vehicle detector



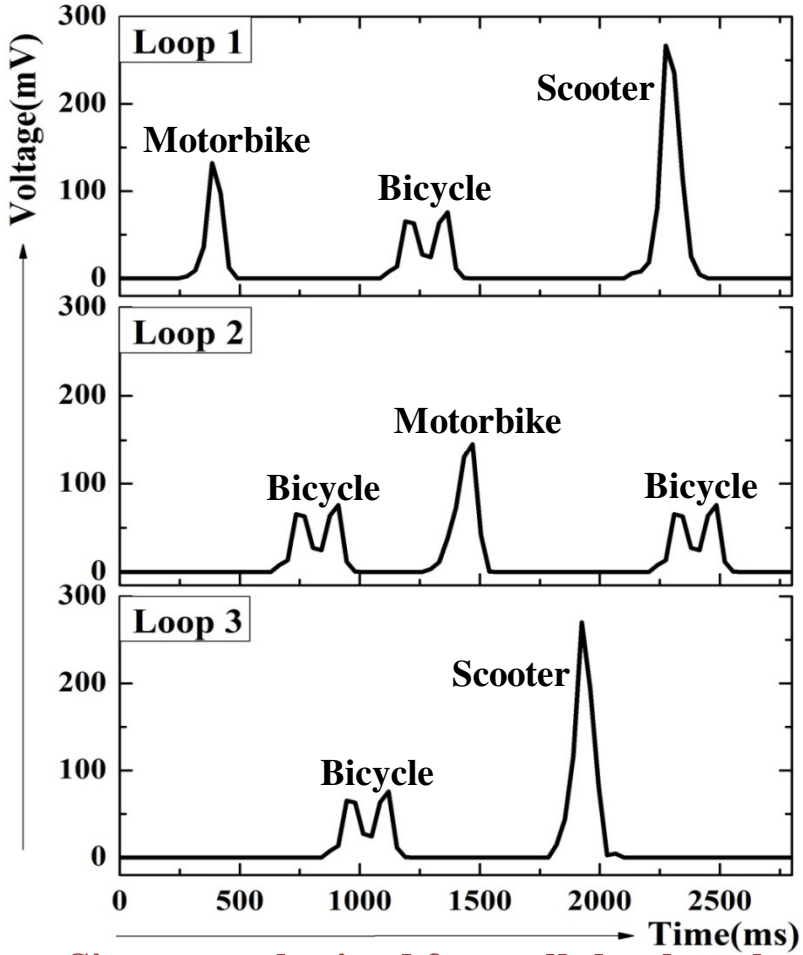
Results from the Mutually Coupled Multiple Loop Detector

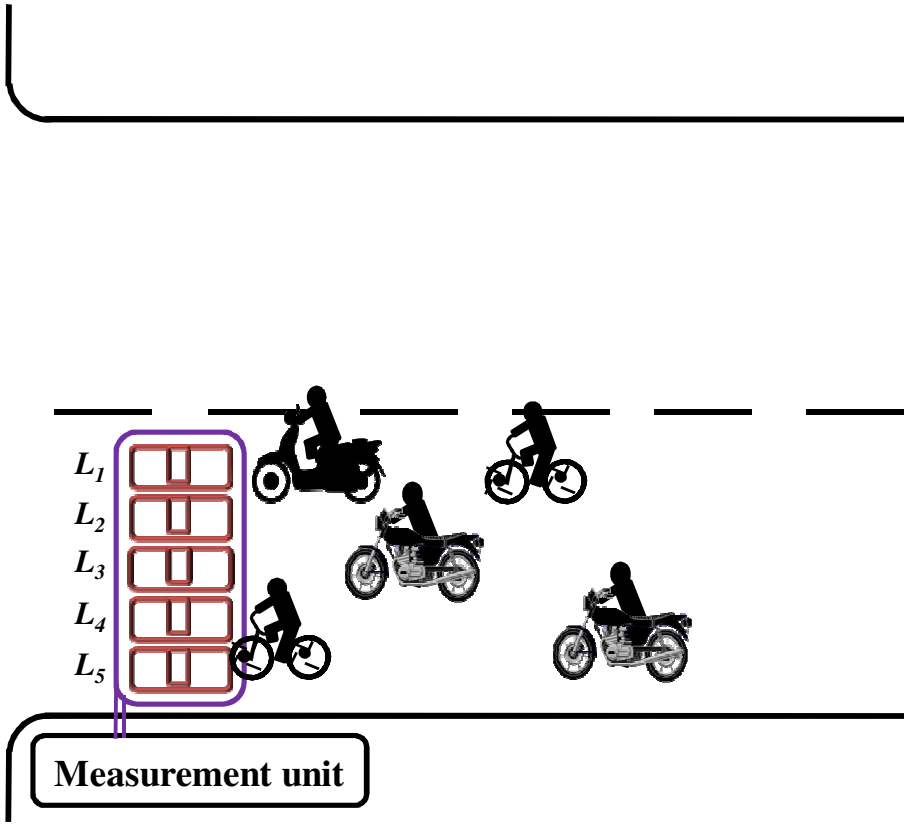


Signature of a car obtained from multi-loop vehicle detector



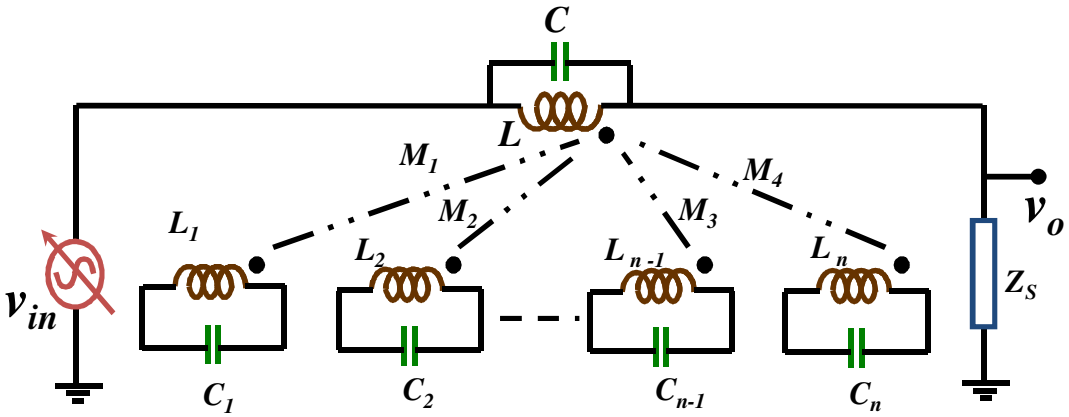
Results from the Mutually Coupled Multiple Loop Detector

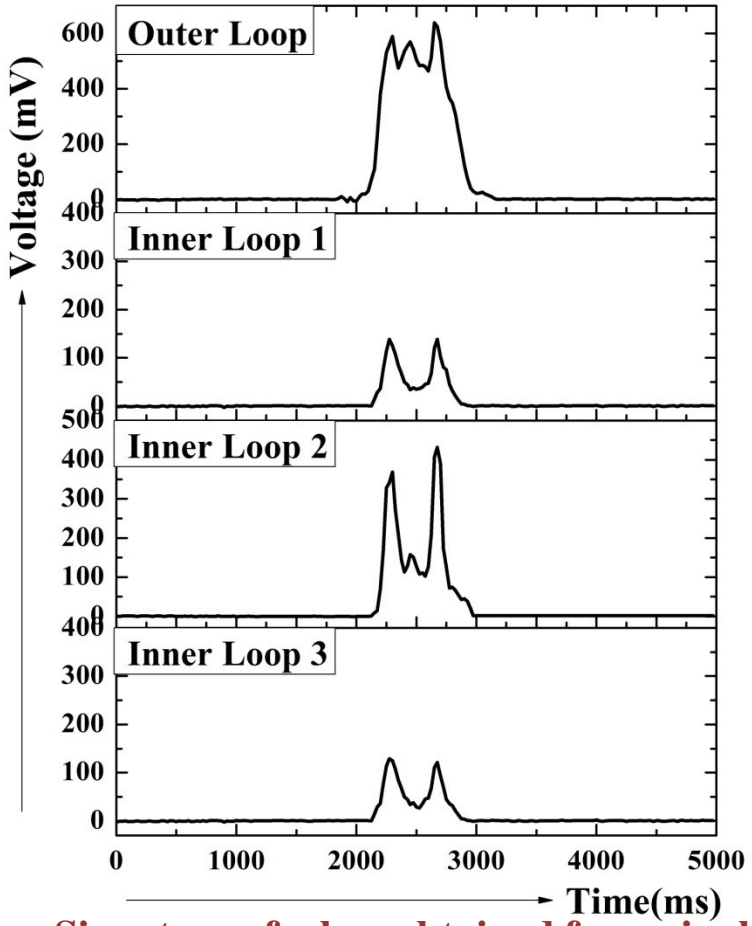




Signature obtained from all the three loops when there was continuous movement of vehicles

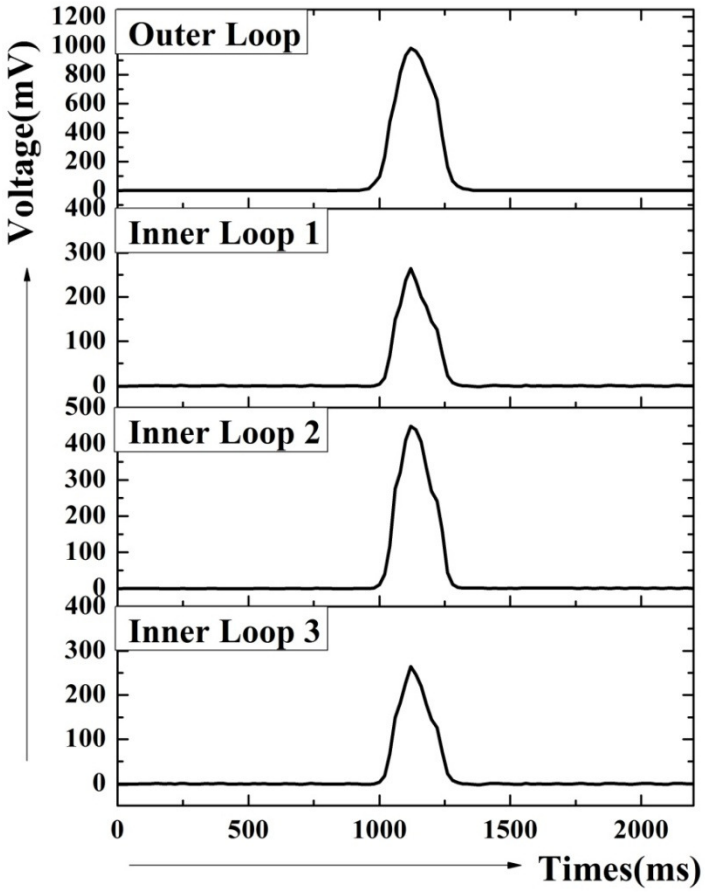
Results from the Mutually Coupled Multiple Loop Detector with Outer-loop resonating



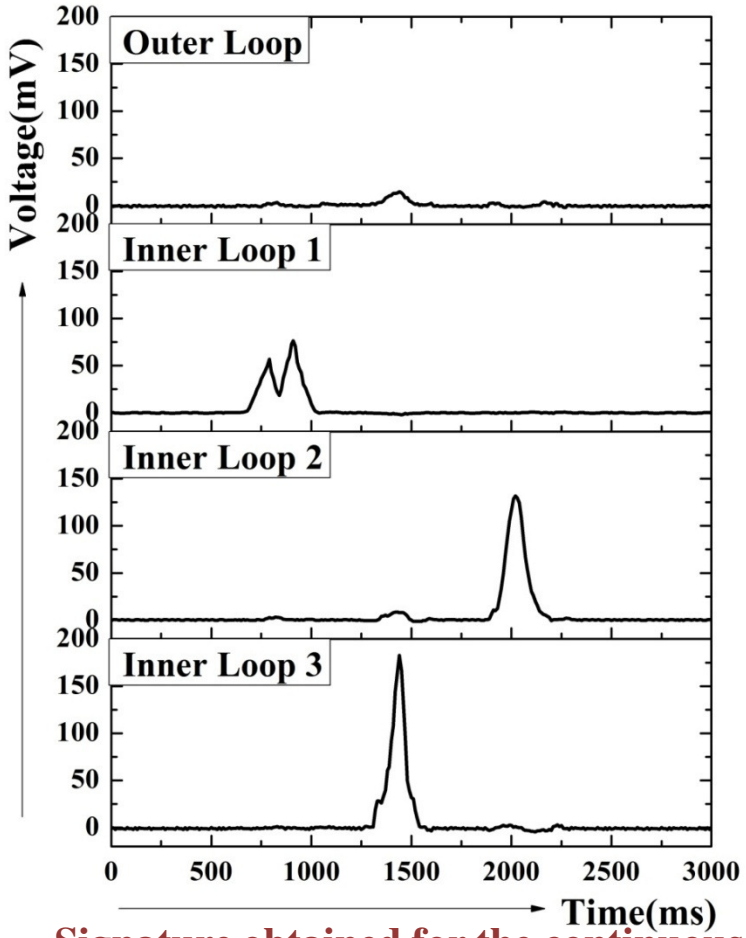


Signature of a bus obtained from single outer loop and multiple inner loop

Results from the Mutually Coupled Multiple Loop Detector with Outer-loop resonating



Signature of a car obtained from single outer loop and multiple inner loop



Signature obtained for the continuous movement of vehicles from single outer loop and multiple inner loop

Thank you

ACKNOWLEDGMENT

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