



Review of Different Approaches to Distance Based Charging

ITS in Europe 2008

Jakub Rajnoch

Geneva 4-6 June

Distance Based Charging (DBC) I.

Common charging principle:

The charge a vehicle is liable for is calculated on the basis of the distance travelled.

Charge Objects are defined for elements of the road network which are subject to charge

The elements of the road network may include:

1. A specified road or set of specified roads or their sections
2. An area covering an unspecified set of roads or their sections

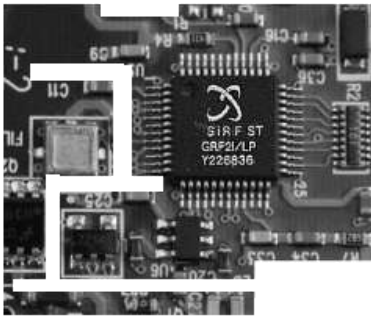
Common distance determination principle:

To determine the distance a vehicle travelled on the journey within a charge object, the vehicle's location data must be obtained.

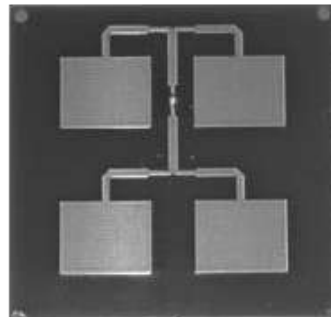
Distance Based Charging II.

Various approaches from the technology point of view:

GNSS



DSRC



Tachograph
Odometer



Distance Based Charging III.

Various approaches from the environment point of view:

Urban



All

Inter-urban



Location data obtained from GPS receiver (latitude/longitude)

Various classification criteria:

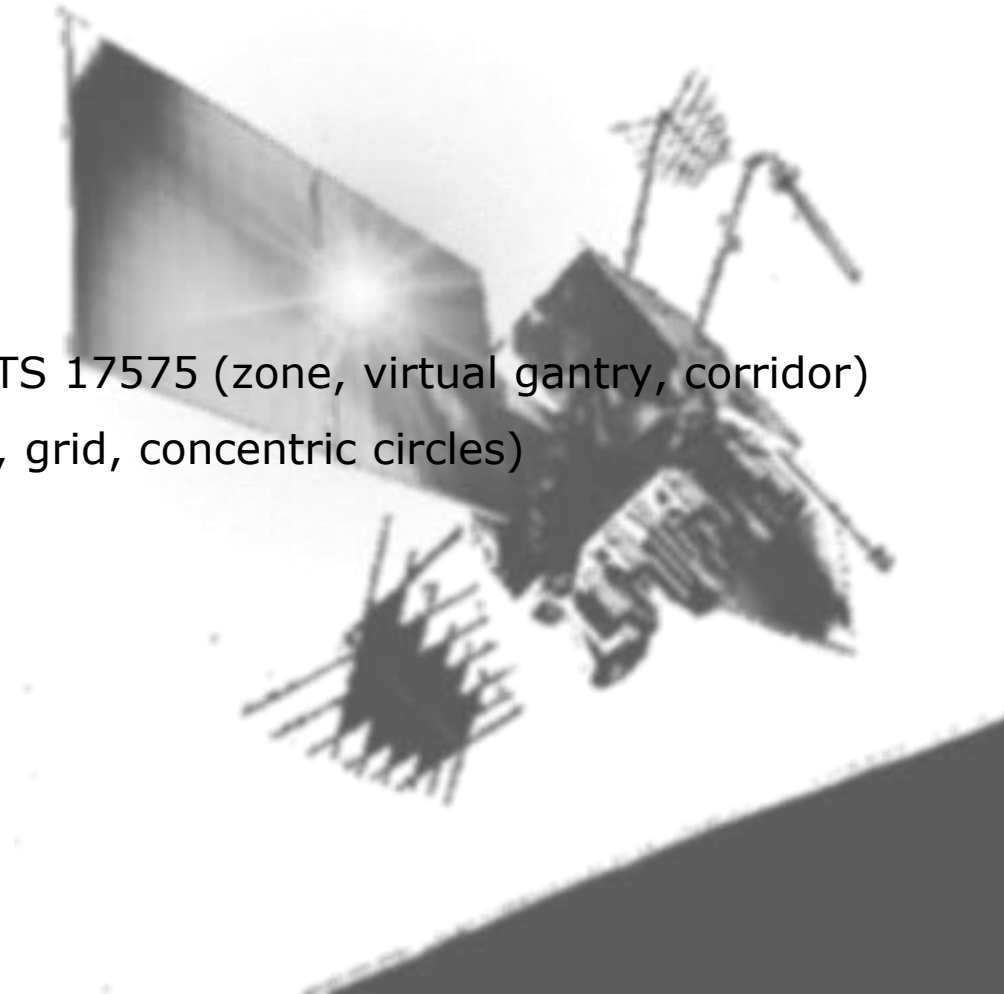
1. Clients

- Thin/Thick

2. Charge object geometry

- according the MISTER and ISO/PDTS 17575 (zone, virtual gantry, corridor)
- alternatives (digital map, segment, grid, concentric circles)

3. Matching algorithms

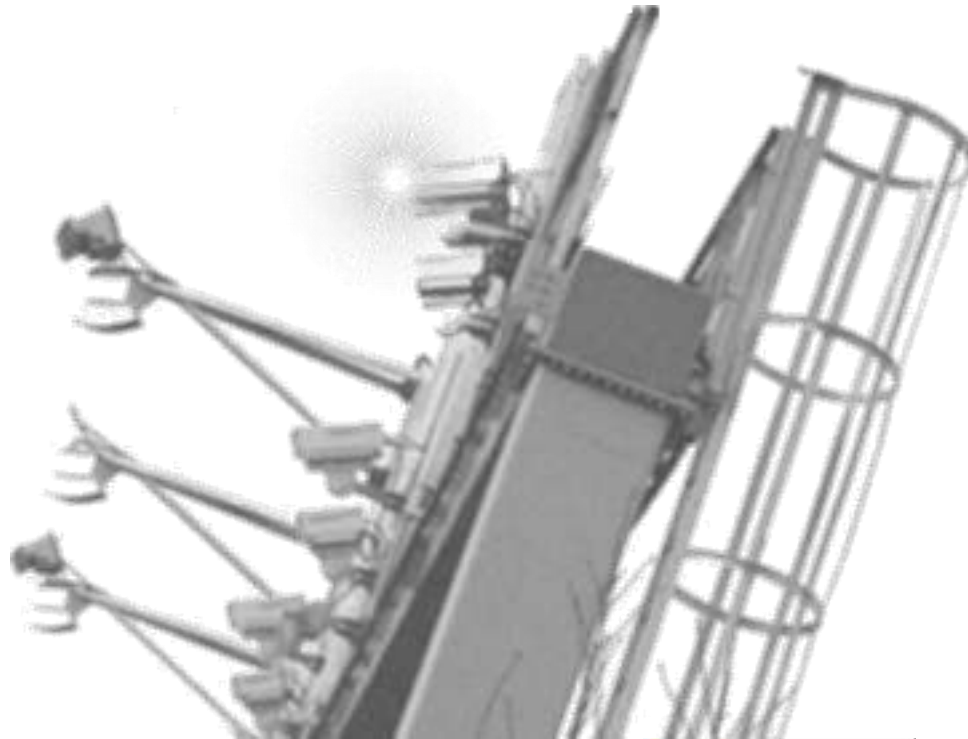


Location data obtained through the detection at the gantry (detection point location)

Classification criteria:

1. Detection points location

- Open system
- Closed system

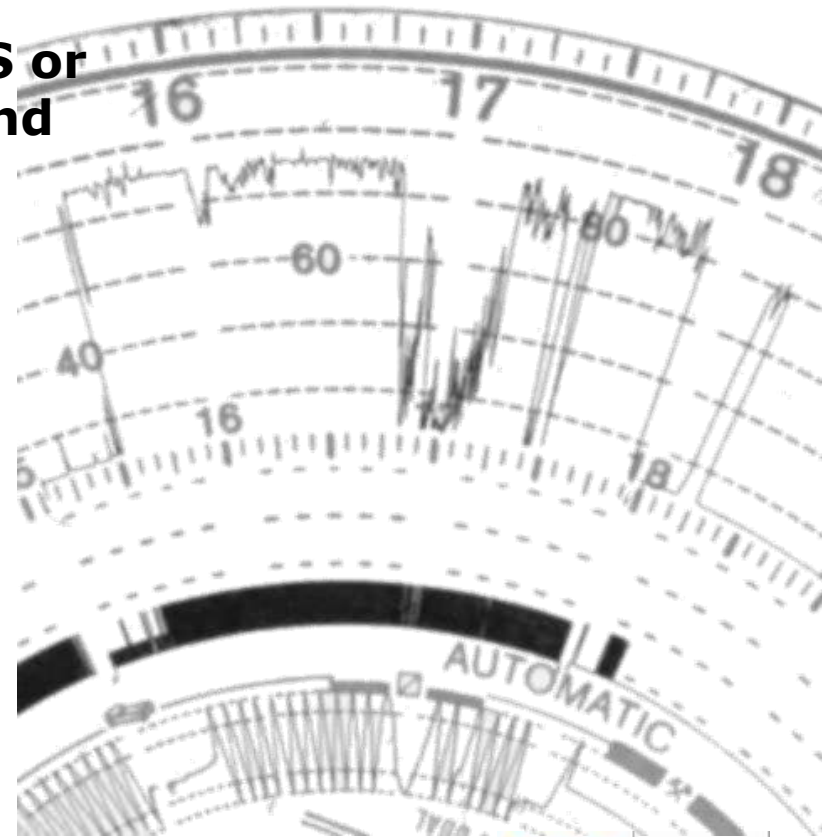


Odometer || Tachograph

No location data obtained

Odometer/Tachograph provides the data regarding the speed/distance of the vehicle

Usually used in combination with GNSS or DSRC technologies (to provide entry and exit to charge objects)



Schemes and Trials

Schemes:

1. MYTO CZ (Czech Republic)
2. GO Mautsystem Für LKW und Bus (Austria)
3. TIS (France)
4. Telepass (Italy)
5. LKW-MAUT (Germany)
6. LSVA (Switzerland)

Trials:

1. Congestion Charging Technology Trials (TfL, London)
2. A pilot road pricing application based on GNSS, Valencia (before 2004)
3. PROGRESS GPS Trials
 - Copenhagen (2000-2004, 2 years)
 - Bristol (2000-2004, 3 months)
 - Gothenburg
4. Research on the accuracy and reliability for distance based measurement, Netherlands (2007, 4 weeks)

All schemes are inter-urban, except Switzerland (both urban and interurban).

Schemes

Technology	Classification criteria		Name (country)	Roads Covered (km)	OBU's	Gross Revenue (€)	OPEX Yearly (%)	
DSRC	Open	Corridor	MYTO CZ (Czech Republic)	1.200	200k (2008)	210M (2007)	n/a	
			GO Mautsystem Für LKW und Bus (Austria)	2.080	900k (2008)	984M (2007)	9% (estimate)	
			TIS – only part of (France)	8.300	1.200k (2004)	6.800M (Net 2006)	5.5%	
			Telepass – only part of (Italy)	5.600	4.500k (2005)	5.300M	n/a	
	Closed	Corridor	TIS – only part of					
			Telepass – only part of					
GNSS	Thick client	Corridor	LKW-MAUT (Germany)	12.700	610k (2008)	3.400M	22.5% (budget)	
Tachograph	Zone or Charged area		LSVA (Switzerland)	60.000	60k (2008)	850M (2007)	6.5%	

Trials

Technology	Classification Criteria		Trial/Trial stages (year)	Subject of the assessment
GNSS	Urban	Zone	London Stage 1 (2003-2004)	GPS accuracy
		Corridor (def. as Segment)	London Stage 2 (2005-2006)	GPS, matching and billing algorithms accuracy
	Urban Inter-urban	Corridor, Zone, Virtual Gantry	Valencia (before 2004)	GPS and the matching algorithm accuracy
	Urban	Zone	Copenhagen (2000-2004)	Driver behaviour changes, impact on the urban environment
	Urban Inter-urban	Corridor	Bristol (2000-2004)	GPS accuracy
	Urban	Zone	Gothenburg (2000-2004)	Effects on the congestion level, environmental improvement and mobility management
GNSS Odometer	Urban Inter-urban	Corridor, Zone	Netherlands (2007)	GPS and the distance calculation accuracy

