

Delivering Usage-Based Road Pricing

Ian Wilkinson

Overview

■ Choosing the Charging Concept

- ◆ Fitness for purpose
- ◆ Acceptability
- ◆ Deliverability

■ Charging by time

- ◆ Introduction
- ◆ How?
- ◆ Comparison with distance
- ◆ Managing congestion

■ Issues

Choosing the Charging Concept

■ Types of Usage-Based Charge

- ◆ Discrete usage events (e.g. points passed) in charging period
 - ◆ Distance travelled in charging period
- and
- ◆ Time spent using roads in charging period

■ Which to use ?

- ◆ Fitness for purpose (match to objectives of charging scheme)
- ◆ Acceptability (to users)
- ◆ Deliverability

Choosing the Charging Concept

■ Fit to scheme objectives

- ◆ Manage transit traffic (some roads, some vehicles)
- ◆ Manage HGV traffic (some roads, some vehicles)
- ◆ Finance road infrastructure (some roads, all vehicles)
- ◆ Manage congestion (some roads, all vehicles)
- ◆ General taxation (all roads, all vehicles)

- ◆ All roads means avoiding having to equip roads
- ◆ All vehicles means either avoiding having to equip vehicles or keeping it very cheap and quick to install

- ◆ Is equipment for distance-based charging very cheap and simple to install for all vehicles?

Choosing the Charging Concept

■ User acceptability

- ◆ Privacy
- ◆ Fairness (including being fair for occasional users)
- ◆ Ease of Use

- ◆ Is the ability to enable “other services” a driver for acceptability for ALL vehicles?
- ◆ Is knowledge of location a risk to acceptability?

Choosing the Charging Concept

■ Deliverability

- ◆ Technically achievable
 - ◆ Practically achievable
 - ◆ Affordable
-
- ◆ Is the equipment for distance-based charging practical enough to be deployed in ALL vehicles cheaply and quickly such that the scheme remains affordable and deliverable?

Charging by Time

■ Time plays several roles in road pricing schemes

- ◆ Used to define the charging period
- ◆ Used to define periods for varying charges within the charging period
- ◆ Can also be used as the measure of use - charge by duration of use in charging period

Charging by Time



Charging by Time

The top screenshot shows the hirecentres.com website with a blue box labeled "Tool hire" overlaid. The bottom screenshot shows a telephone call log with a blue box labeled "Telephone use" overlaid.



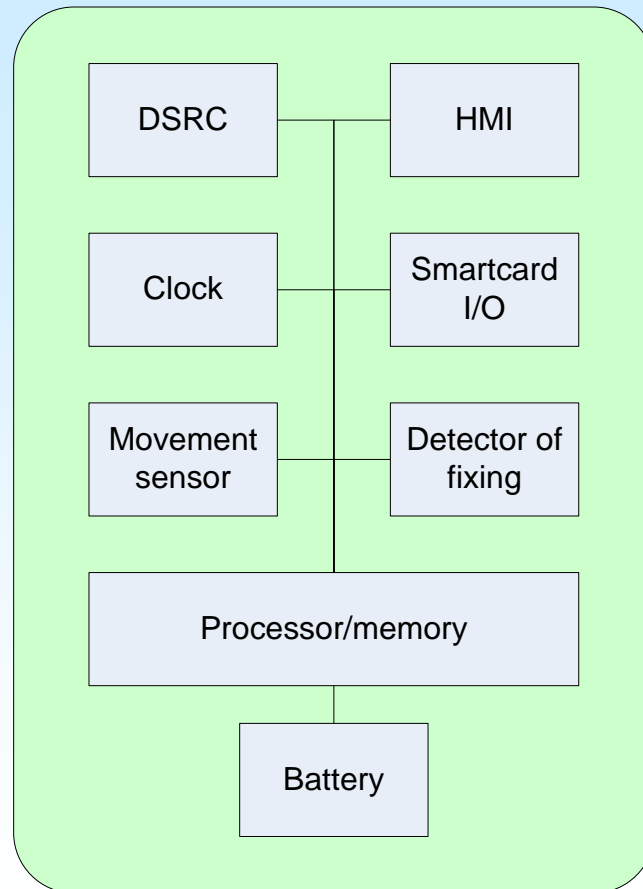
A photograph of a car parking sign. The sign is blue and white, with a "PAY HERE" sign above it. The main sign lists "LITTLE ROODEE PAY & DISPLAY CAR PARK" and "DAILY CHARGES". A blue box with the text "Car parking" is overlaid at the bottom.

A screenshot of the AVIS car hire website. A blue box with the text "Car Hire" is overlaid on the right side of the page.

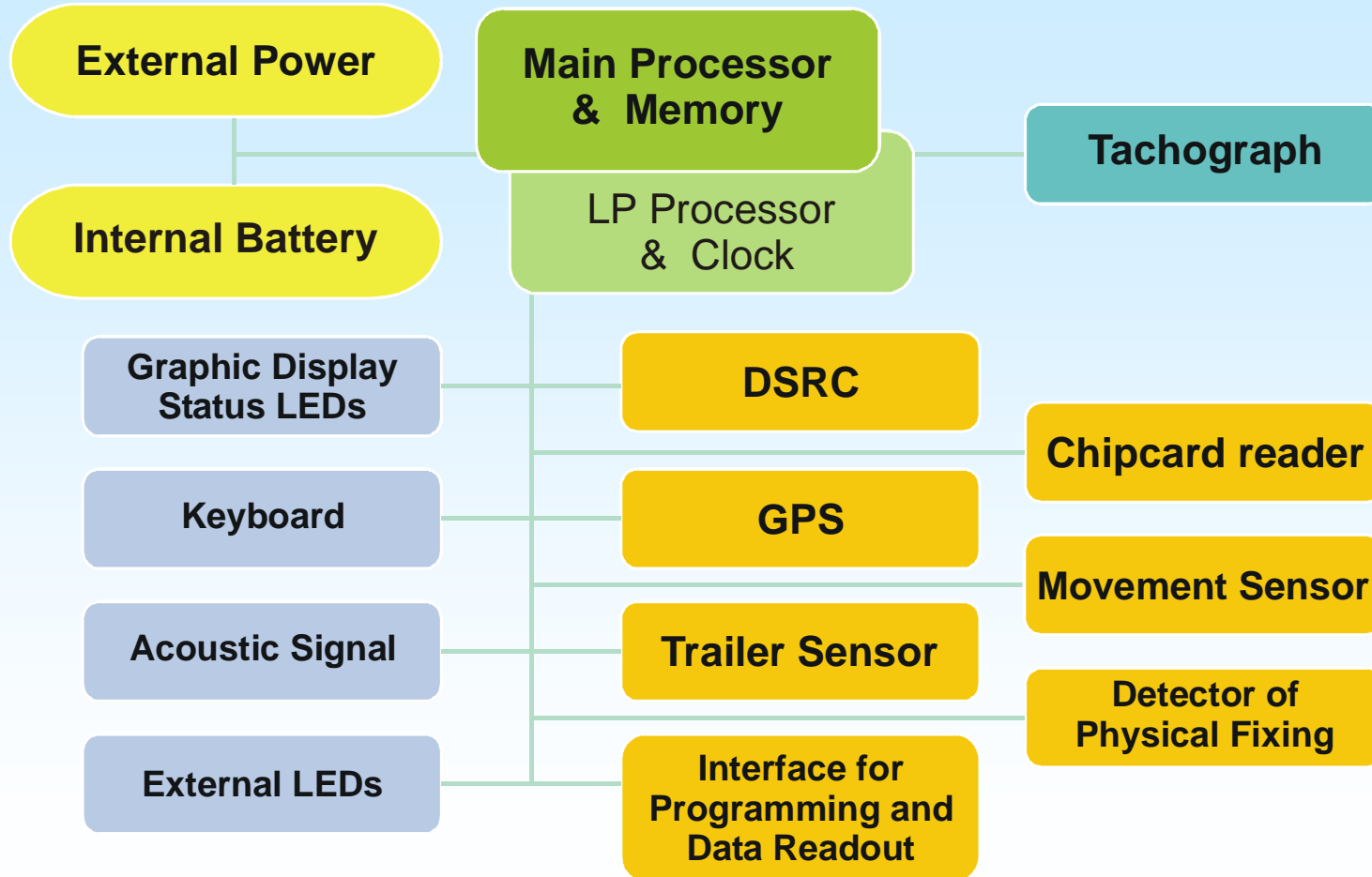
Charging by Time

- **Consider fine granularity time charges (minutes or hours) based on duration of use**
- **Most feasible concepts**
 - ◆ Elapsed time - duration vehicle is in the charging area
 - ◆ Driven time - duration vehicle engine is on in the charging area
 - ◆ Moving time - duration vehicle is moving in the charging area

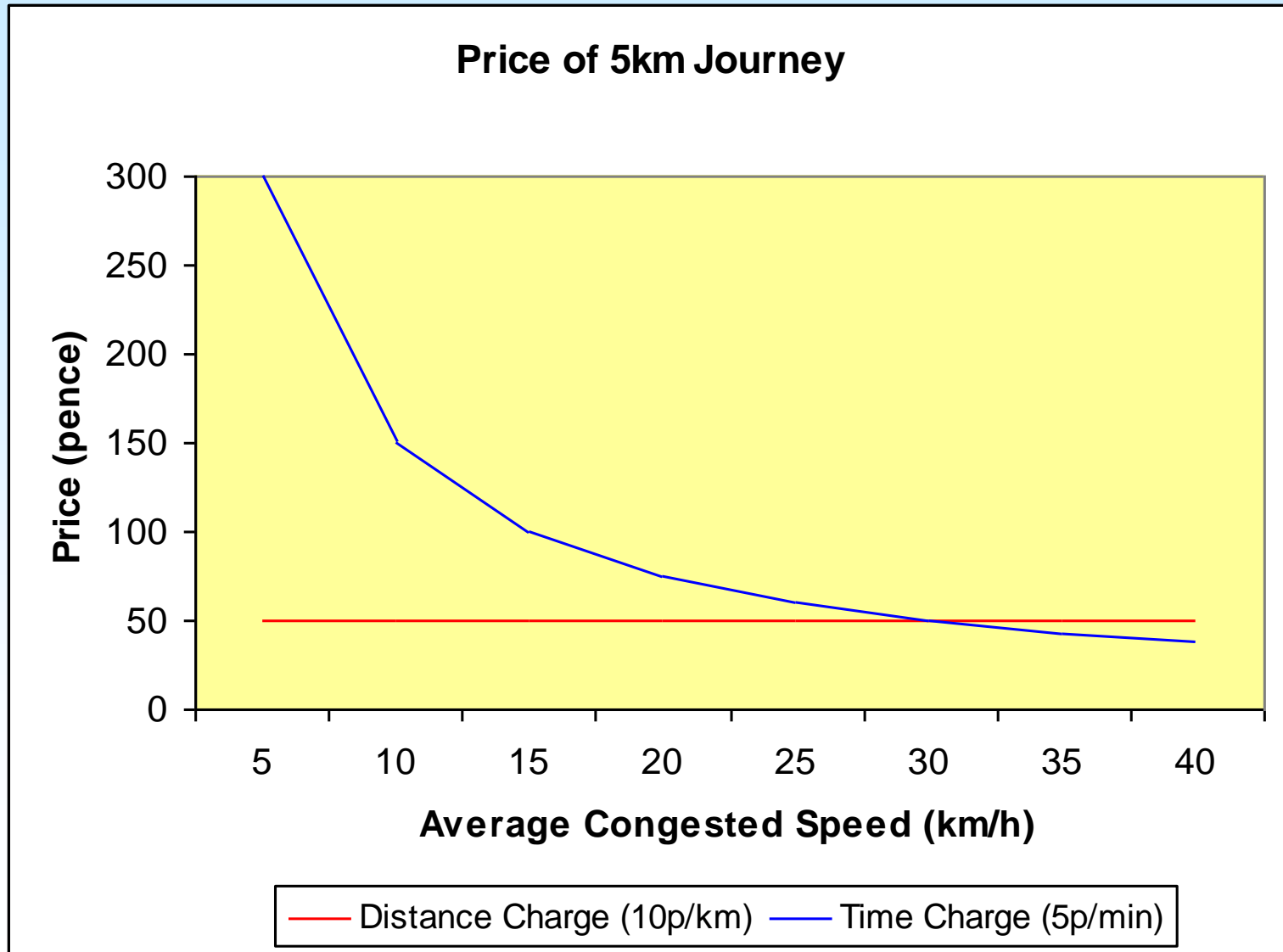
Charging by Time – How?



Charging by Time – Comparison with Distance



Charging by Time – Managing Congestion



Charging by Time - Managing Congestion

■ Distance travelled

- ◆ relatively poor measure of contribution to congestion
- ◆ need to have the ability to vary charges by location and time

■ Duration of use

- ◆ directly reflects road occupancy
- ◆ implicitly reflects travel in congested conditions
- ◆ don't need vary charges by location

■ For time-based charging don't need to know location

Charging by Time – Summary of the Theory

■ Deliverability

- ◆ No location needed and duration of use is easy to measure
- ◆ So simpler, cheaper equipment, more suitable for occasional users
- ◆ And no power connection to vehicle needed, so users can fit it, quicker to deploy, less warranty / vehicle compatibility risk
- ◆ Means scheme is more likely to remain affordable
- ◆ Feasible to apply to all vehicles and all roads

■ User Acceptability

- ◆ Potentially easy to use and understand basis of charges
- ◆ Fair – potentially better than distance for congestion management
- ◆ Greatly reduced privacy challenges as doesn't need location
- ◆ Other ITS services unlikely to be key driver for acceptance

■ Fitness for Purpose

- ◆ Can support congestion management objectives
- ◆ Can support general taxation objectives – because it can apply to all vehicles and all roads

Practical Issues

- **Usage charges may have good and bad consequences**
 - ◆ Distance: + reduce distance travelled
 - use congested roads, inappropriate roads for vehicle
 - ◆ Time: + drive less, switch off engine if queuing
 - risk taking, drive faster
- **Unwanted behaviour seen with some charging schemes**
 - ◆ Time-of-day price changes too large
 - ◆ Mitigated by more sensitive application of charging policies
- **For time-based charging need to remove / reduce risk**
 - ◆ Low speed cut-off (exponential increase in charge)
 - ◆ Excessive time associated with major jams
 - ◆ Small increments
- **Need to research higher granularity time-based charging effects on behaviour**

Summary

- **Charging all vehicles and/or on all roads is quite challenging !**
- **More granular time-based charging is more deliverable than distance-based charging**
- **Time-based charging appears ideal for managing congestion and for general taxation**
- **Some practical issues need research**

- **If it is not deliverable, there is no charging at all !**