**Toll Collection In Germany**

* German Compnay for running toling system for trucks
* Devlopment started in September 2002 but opened in January 1, 2005
* Based on GPS
* Trucks equipped with embedded systems called On bOard Units
* OBUs used for positioning, moniotoring and billing.
* Also have infrared interface for communicating with stationary control stations on roads.
* Charge per kilometer varies according to the number of axles and vehicle emiision category, length of toll stretch

**Toll Collect Payment system in three forms.**

* Pre booking a particular route over the internet
* Paying at terminals like found in fuel stations
* Fully automated billing using OBU deployed receiving GPS signals.

**Procedure**

* When truck is started, OBU localizes the vehicles by satellite navigation.
* Position and road data stored in OBU which determines the toll regulation for that particular route.
* Data transferred to data center by mobile communication and processed for billing.

**Enforcement Mechanism: Switching off OBUs**

Cameras photographing trucks and cross checking at mobile data centers and compared with central computing systems

**Flaws of the system**

* High cost of OBU.
* Interference in situations where signal is lost.
* User’s reluctance in having their movements tracked.
* The flaw using this technique is fraud due to the fact that vehicle owners may mount defeat devices in their vehicles which may not be able to effectively calculate the distance covered by the vehicle resulting in their tolls being undercharged.

**Toll Collection in USA**

**Introduction**

* 51% of toll roads are used in USA.
* Use ETC as an alternative to paying cash
* [E-ZPass](https://en.wikipedia.org/wiki/E-ZPass) system used on most toll roads

**EZ Tag : Houston, Texas**

* ETC system that allows motorists use reserved lanes to pay tolls without stopping
* Devloped in the late 2003

**Working Principle**

* Driver registers; Website, Telephone or store locations
* Transponder given to driver to attach inside the wind shield
* Transponder cotains information about systems
* Driver use lanes equipped with EZ tag Transmitters and sensors
* Dedcution made to appropriate accounts

**Flaws Chasing News**

#### RFID systems can be easily disrupted

* RFID tag collision
* RFID reader collision or interference
* Sued by customers over administrative fess including missing a toll payment, filing to update credit card information.

**Toll Collection in England**

Dartford Crossing

UK Government

Automated number plate reconition system named Dart Charge

Introduced in November 2014

Charge paid online or phone advance or by midnight after crossing

The Optical Character Recognition (OCR) is a mechanism that converts images of handwritten, typed, or printed text, scanned documents, scene photos including sign board texts or simple a photo of a document. Number plate recognition has been used in tracking vehicles over the years to reduce vehicle theft and improve border control. Sensors have been installed here to detect the vehicle presence when it enters the toll charge region.

[29] A digital camera is employed and fixed at an angle parallel to the horizon. The camera captures an image of the number plate of the vehicle. The image is sent to a control station. This system makes use of an Artificial Intelligent Agent that has been trained with pre-captured images of number plates in JPEG format and preprocessed by changing colored images to greyscale level. The new colored JPEG image captured will therefore have to be converted to grey scale image. As a precaution, dilation is performed to remove unwanted noise. This is just a process for filling empty spaces and maximizing the brightness on the captured image in addition to sharpening the edges of the image and connecting any broken lines.

Further processing is performed and license of the vehicle is determined. Program goes through a database to determine the owner of the vehicle so charged toll is collected automatically. This system ensures that vehicles have free flowing traffic at a particular highway.

[30] The Texas Department of Transportation has employed this system after considering other alternatives.

**[31] FLAWS OF THE OCR**

* Scene complexity
* Conditions of uneven lighting
* Skewness(Rotation)
* Blurring and Degradation
* Aspect Ratios
* Tilting (Perspective Distortion)

Drivers who fail to pay are issued penalty charge notice. We check this against DVLA records to make sure the correct charge is applied.

**TOLL COLLECTION IN SOUTH AFRICA**

Soth Africa Roads Agency Sanral on selected toll roads in 2014

Two main ETC methods are: Boom down ETC

Open Road Tolling (Gauteng Province in December 3, 2013)

The multi-lane free flow ETC system operates without any toll booths. Cameras and other sensors mounted on overhead gantries register either the e-tag or the vehicle license plate number, and an amount is deducted from an eTag registered road user's account. For verification each vehicle is photographed from above for length classification, with additional photos of the front and rear number plates.[[1]](https://en.wikipedia.org/wiki/E-toll_(South_Africa)#cite_note-san-1) The 43 overhead gantries are spaced at about 10 km intervals on the [N1](https://en.wikipedia.org/wiki/N1_road_(South_Africa)), [N3](https://en.wikipedia.org/wiki/N3_road_(South_Africa)), [N12](https://en.wikipedia.org/wiki/N12_road_(South_Africa)) and [R21](https://en.wikipedia.org/wiki/R21_road_(South_Africa)) highways

At conventional toll plazas, in lanes marked with the e-tag sign, overhead equipment register and verify the details of an e-tag in a slow-moving vehicle, and an amount is deducted from the road user's toll account, whereupon the boom lifts,[[1]](https://en.wikipedia.org/wiki/E-toll_(South_Africa)#cite_note-san-1)or a light turns green.