

# SCOOT

## Advice Leaflet 3: SCOOT control of pedestrian facilities

### INTRODUCTION

When traffic signals are controlled by a UTC system they are all constrained to operate at the same cycle time, except that relatively quiet nodes may double cycle at half the region cycle time. Also, the pedestrian stage is called at the same fixed position in the stage order with its start time dependent on vehicle demand and coordination for vehicles. One consequence can be that pedestrians have to wait longer for an invitation to cross than they would if the crossing or junction were operating independently.

Pedestrian priority facilities have recently been developed for SCOOT in order to reduce waiting times at Puffin and Pelican crossings. This leaflet describes their use and general considerations on how to operate SCOOT to help pedestrians, including restricting the maximum cycle time. It should be read in conjunction with TAL 5/05 and TAL 1/01.

### SCOOT MODELLING

SCOOT models what is actually happening at crossings, i.e. whether the pedestrian stage was called or not, by the use of feedback. In SCOOT MC3, the feedback has been enhanced to model the length of the variable intergreen at Puffin crossings and at junctions where Puffin type pedestrian facilities are used. It is strongly recommended that feedback is turned on at all pedestrian crossings and junctions with pedestrian facilities to take advantage of feedback and the resulting enhanced modelling.

### PUFFIN AND PELICAN CROSSINGS

Puffin and Pelican crossings operate in different ways. With Puffins, pedestrians are presented with near-side indicators and vehicle movements are positively controlled using conventional three aspect signals as at junctions. Pelican crossings use far-side

pedestrian signals and do not positively control all vehicle movements. During the flashing vehicle amber it is individual drivers who decide whether to proceed. The rules are



clear, that drivers should not move when there are pedestrians on the crossing, but the drivers are not held at a red signal.

The difference for SCOOT control of the two types of crossing is in the modelling of the length of the pedestrian stage. The variable intergreen at Puffin crossings can be modelled accurately using the new feedback facility, but the length of the flashing green man / flashing vehicle amber period used by pedestrians at a Pelican crossing cannot.

At Pelicans the feedback will be used to model when the pedestrian stage occurs and when it does not. At Puffins there will be the added advantage of correctly modelling the length of the pedestrian stage.

## DOUBLE CYCLING

Pedestrian waiting times for any control strategy are directly related to cycle time. Puffin and Pelican crossings are normally considerably less saturated than junctions in the same region; they have only two stages and the pedestrian stage is not as long as many vehicle stages. Therefore, when giving priority to pedestrians, the first action recommended within SCOOT is to force double cycling of all Puffin and Pelican crossings, unless the consequent extra vehicle delay will be prohibitive at a particular crossing.

## PEDESTRIAN PRIORITY STRATEGIES

Pedestrian priority strategies have been developed, which reduce pedestrian waiting times compared with existing SCOOT control. These strategies, which are available in SCOOT MC3 Service Pack 1, are equally applicable at Pelican and Puffin crossings although all the testing has been at Puffins.

The strategies work by reducing the time before the next pedestrian stage can be initiated on street. Within SCOOT the offset optimiser seeks the optimum time in the cycle that the pedestrian stage can run when it will cause minimum delay to vehicles. When a strategy is in operation the start time of the pedestrian stage can be advanced from the optimum time for vehicles. Under normal use, the priority strategy will still only allow one occurrence of the pedestrian stage per junction cycle time.

At heavily used crossings when the pedestrian stage is called in almost every cycle a strategy of advancing the start of the pedestrian stage from the vehicle optimum is not sensible. All that would happen would be that the stage would start early in each cycle by the same amount. Therefore, the time between pedestrian stages would be the same as if they all started at the optimum time for minimum vehicle delay. There would be no benefit for pedestrians, but extra delay for vehicles. Such behaviour is prevented in the strategies by limiting the change that the strategy can make to the pedestrian start time depending on how often the strategy reduced the time in the preceding cycles.

Hence, the benefits to pedestrians, reductions in their waiting times, will reduce as the pedestrian volumes increase. When the pedestrian stage is called every cycle, the priority strategies will have no effect.

The strategies are designed to provide the traffic manager with control over the level of priority afforded to pedestrians and the disruption to vehicular traffic. During the development several control parameters were investigated. In the recommended strategy the degree of priority to pedestrians is limited by the vehicular degree of saturation of the crossing and enhanced by the waiting time of pedestrians. How much the degree of saturation limits the priority is controlled by a user-variable parameter.

This strategy will provide useful reductions in pedestrian waiting times without risk of large increases in vehicle delays. Reductions approaching 20% were obtained at the test sites, but the benefits to pedestrians will be limited when the vehicles flows are high.





### Long cycle times

At Puffin and Pelican crossings with very high vehicle flows it may be necessary at some times to operate them with long cycle times. The action of the priority strategy may then be to advance the start of the pedestrian stage by so much that it is possible for it to run again, at its normal optimised time in the same cycle. If it is really necessary to operate at such a long cycle time, then a second occurrence of the pedestrian stage in a cycle will be very disruptive. It is recommended that the second occurrence is prevented by setting the flag provided for this purpose.

### SCOOT PARAMETERS

It is important that the various SCOOT parameters controlling the operation of junctions and pedestrian crossings are set correctly and appropriately to achieve the intended effect. In particular, when using the pedestrian priority strategies, the ability of the strategy to start the pedestrian stage early is limited by the minimum stage length in the SCOOT database. The minimum should be set to a value appropriate for a VA Pelican or Puffin, *not* one operating in fixed time mode.

Other important parameters are the maximum region cycle time and the force double cycling status of Puffins and Pelicans.

### ALTERNATIVE METHODS OF CONTROL

The SCOOT pedestrian priority strategies have been designed to provide a tool for traffic engineers to give a measure of priority to pedestrians without serious disruption of vehicle operations.

Operating Puffin and Pelican crossings under VA with pre-timed maxima will minimise pedestrian delay. However, it can cause large net costs, due to increased vehicle delay, compared to SCOOT at busy times. Operating under SCOOT, with the priority strategy, at some times of day and VA at others will require installation and maintenance of two sets of detectors. The cost can be reduced by using MVD for the VA detection.

If it is desired to set a firm limit on the maximum waiting time of pedestrians, this can only be achieved in UTC systems by limiting the cycle time and under VA operation by setting the maximum vehicle stage length.

### Importance of coordination

Crossings may be some distance from neighbouring junctions, which cause considerably more vehicle delay than do the crossings. If they are sufficiently far apart, then

poor coordination of the crossing will not cause wasted capacity at the downstream junction. In such circumstances, operating the crossing under VA to give a high level of priority to pedestrians may considerably increase delay at the crossing. However, much of this extra delay will be a relocation of delay from the downstream junction and will not greatly increase the overall journey time of vehicles.

Where pedestrian crossings are close to junctions, good coordination is important and VA operation in busy conditions would be expected to result in a large increase in vehicle delay.

## **PEDESTRIAN FACILITIES AT JUNCTIONS**

The modelling of the variable intergreen in SCOOT MC3 can give valuable benefits at junctions with Puffin type pedestrian facilities. Where the pedestrian stage is called every cycle the benefits of the enhanced feedback are likely to be of the order of a 10% saving in delay to vehicles.

## **REFERENCES**

Traffic Advisory Leaflet, TAL 1/01, Puffin Pedestrian Crossings, DfT.

Traffic Advisory Leaflet, TAL 5/05, Pedestrian Facilities at Signal-Controlled Junctions

The improved modelling of the variable intergreen will, however, not be of direct benefit to pedestrians. There is no ability at present to provide priority to pedestrians at junctions. The pedestrian stage will be served once per cycle at the same point in each cycle. To reduce pedestrian waiting times at junctions it is necessary to reduce the cycle time. A junction with a pedestrian stage will operate at least 3 stages (two vehicle stages and the pedestrian stage). Consequently, it is unlikely to be able to double cycle without causing appreciable delay to vehicles unless it is very much less heavily loaded than the busiest junctions in the region. Therefore, the main way of limiting pedestrians' waiting times is to set as low a limit as possible on the maximum region cycle time. How low the maximum is and the consequent effects on pedestrian waiting time and vehicle delay will be a local policy decision.

As an example, in London the policy is to have a maximum cycle time of no more than 88 seconds at any junction with pedestrian facilities.