# ParkLife Report – Gate Sensors

Version 0.1A

The photographs below show the gate sensor (grey box and cable) that was developed for the project deployed to measure activity through the access gates to the children’s play areas within the four parks. We chose our specific gate sensor design for flexible deployment and to be very low power, since it could only be realistically deployed to a variety of styles of existing gate as a small standalone long-life – in excess of six months – battery powered device with its own internal LoRaWAN communications radio.

A picture containing ground, fence, outdoor

Description automatically generated

The gate sensor uses a simple magnetic reed switch, similar to that used on windows in home security systems, where the switch part is mounted on the fixed upright of the gate next to the latch, and the magnet is attached in alignment with the switch to the moving end of the gate. The reed switch is on a length of cable, enabling the sensor to be safely retro-fitted to a variety of different gate designs, some with physical latches and some that have auto spring closure mechanisms, without interfering with or damaging the materials of the gate itself.

When the gate is closed, the magnet is in position next to the reed switch causing its two internal wires to bend together and complete the circuit; when the gate is opened the magnet moves away from the switch and its two internal wires bend apart breaking the circuit. Both these states of the circuit are detected, and an internal counter is incremented each time the open/close state changes. A minimum state change period of a few seconds, i.e. enough time for a person to pass through the gate, is used to reduce the number of spurious readings from wind etc.

The count of gate openings is sent every 5 minutes whenever there is activity. To save power, if the gate is not active, then a message is sent only once per hour, with the current gate state open/closed, to ensure we know the sensor remains able to communicate. This also enables us to identify if perhaps the sensor has failed, e.g. the magnet or switch has become detached, if all bar one of the gates in the same area are reporting a rate of gate activity. A gate remaining open may also be a cause for concern, since many urban parks surround children’s play areas with metal fencing and access gates to prevent dogs not under owner control from entering.

The graph below shows the raw gate openings count data collected over a single day from the four gate sensors deployed to the two children’s play areas in the Meadows park. For maximum efficiency these sensors use a single 8-bit byte for storing the counter value, which means they can represent up to the value 254 (the value 255 is reserved as a control signal) before rolling over to count from zero again. The red/green shaded areas represent the two gate sensors for the much larger modernised play area and the purple/blue shaded areas represent the two gate sensors for the older smaller younger children’s play area. Only when the gates have any activity over the 5-minute measurement period are the counts plotted.

A close up of a map

Description automatically generated

The steepness of the edge line on the filled area shows just how busy each gate is. The green gate starts to be active from early in the morning in the large play area, and the morning period is busier than the afternoon period on this particular day. One can see from this graph that the large modern play area is much more active than the older smaller play area which is only active from late morning to mid-afternoon.

Unfortunately, the nature of these spaces and the restriction on the level of permanency we were able to apply to these prototype gate sensor installations, did result in periodic damage and vandalism of the sensors. We had to repeatedly replace them with new units over the course of the project. However, we did prove that activity of a family space in the park could be measured effectively with these simplest of sensors, in order to develop an understanding of the relative level of busyness over time for the children’s play areas, without any impact on individuals’ privacy. An option for future product development would be the creation of an access gate with the sensors built internally within them so that they are fully encapsulated and protected by the gate structure itself.