

Autonomous Valet Parking

RISK ASSESSMENT - Carpark Data Capture

MANUAL DRIVING WITHIN THE CARPARK OF THE STREETDRONE ONE VEHICLE IN ORDER TO CAPTURE DATA

<p><u>PROJECT OVERVIEW</u></p> <p>The project, which is a consortium including Parkopedia (lead partner), University of Surrey and Transport Systems Catapult, is looking to deliver a proof of concept involving an autonomous vehicle that will fulfil the valet function by navigating the vehicle to a free parking space, executing the parking manoeuvre automatically with no human involvement and responding to a summon request by navigating the vehicle back to the driver.</p> <p>The consortium's key objective is to identify obstacles to full deployment of Autonomous Valet Parking through the development of a technology demonstrator.</p> <p>It aims to achieve this goal by:</p> <ol style="list-style-type: none"> 1. Developing automotive-grade maps required for autonomous vehicles to localise and navigate within a multi-storey car park. 2. Developing the associated localisation algorithms – targeting a minimal sensor set of cameras, ultrasonic sensors and inertial measurement units – that make best use of these maps. 3. Demonstrating this technology in a variety of car parks in the UK. 4. Develop the safety case and prepare for in-car-park trials 5. Engage with stakeholders to evaluate perceptions around AVP technology <p><u>ACTIVITY BEING ASSESSED:</u></p> <p>The activity being assessed is the MANUAL DRIVING WITHIN THE CARPARK OF THE STREETDRONE ONE VEHICLE IN ORDER TO CAPTURE DATA using LIDAR, cameras and IMU mounted on the vehicle.</p> <p>The StreetDrone ONE vehicle, which is a road certified vehicle, will be driven manually within the carpark at low speed (5mph) in order to capture all data from which localisation algorithms will be developed. During the data capture, the StreetDrone ONE driver will be in radio communication with the engineer who will monitor the equipment.</p> <p>The activity is scheduled to take place until the end of 2018 in various carparks in the UK.</p>	<p>Assessed by: Eva Sacks Maysun Hassanaly</p> <p>Date: 28/08/2018</p>	<p>Endorsed by: Brian Holt</p> <p>Date: 28/08/2018</p>
<p>Who might be harmed:</p> <ul style="list-style-type: none"> • StreetDrone ONE driver / engineer • Car park workers / contractors • Third party car park users: Pedestrian, other cars <p>Any accidents or near miss incidents will be logged and appropriate actions taken before recommencing the data capturing exercise.</p> <p>How many exposed to risk: >10</p>		

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Hazards Identified <i>(state the potential harm)</i>	Existing Control Measures	S	L	Risk Level	Additional Control Measures	S	L	Risk Level	By whom and by when	Date completed
<p>Hazard – Collision event General</p> <p>a) The collision of the vehicle with a third party using the road, or pathway, in the carpark, either on foot or in another vehicle.</p> <p>b) The collision of the vehicle with carpark furniture (i.e. posts, caddie and bollards) or other large obstacles.</p> <p>Potential harm -</p> <p>Like with any powered road vehicles there is the potential for a fatality or serious injury in the event of a road accident.</p> <p>Other outcome injury possibilities include cuts, bruises, broken bones, and whiplash injuries.</p>	<p><u>Hardware and Software Controls Measures</u></p> <p>The vehicle has a number of complex hardware and software monitoring systems to ensure safe operation. These include:</p> <ul style="list-style-type: none"> • Vehicle Footbrake (usual manual vehicle controls). <p><u>Other Control Measures:</u></p> <ul style="list-style-type: none"> • The vehicle used in the data capture activity will be operated at speeds of 5mph (walking pace) or below • Data capture activity will be outside of peak hour usage of the carpark. • The drivers must have a valid full UK driving license or an overseas full valid driving license with authorisation to drive on UK / German roads. • All personnel working on the data capture wear a high visibility vest. • In the event of a collision the driver should immediately contact the emergency services (if required) and inform the carpark duty manager. • Signage will be placed at the entrance of the carpark in prominent positions informing users of the activity being undertaken. • Any accidents or near miss incidents will be logged and appropriate actions taken before recommencing the activity. • A first aid kit will be available in the event of a minor injury. This will be held and used by driver (first aider trained staff). • In the event of an emergency stop situation the driver may experience a slight jolt as would be the case in any emergency stop situation when travelling at 5mph and wearing a seatbelt. 	5	1	5	No further action is necessary.					

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Hazards Identified <i>(state the potential harm)</i>	Existing Control Measures	S	L	Risk Level	Additional Control Measures	S	L	Risk Level	By whom and by when	Date completed
<p>Hazard - Fire</p> <p>Potential harm – Burns, complex chemical fumes, asphyxiation. There is the potential for a fatality or serious injury in the event of a fire due to carpark environment (i.e. close space)</p>	<p>In the event of a fire the carpark fire procedure would be followed.</p> <p>In brief:</p> <ul style="list-style-type: none"> • In the event of a fire the carpark duty manager should be immediately contacted so the emergency services can attend. • Only trained firefighting personnel should attempt firefighting. • <u>No attempt should be made</u> if there is any doubt or it is a battery fire • Only extinguishers appropriate for the type of fire should be used. (Dry powder and CO2 for electrical wiring, not battery). <p>The data capture team (driver and engineer) will have access to at least one member from the carpark team who will have conducted annual firefighting safety training and are located close by (e.g. mobile phone contact, radio contact).</p>	5	1	5	No further action is necessary.					
<p>Hazard – Mechanical, electrical, control system failure</p> <p>Potential harm – A wide variety of outcomes possible from causing the vehicle to collide to a warning light coming on.</p>	<p>The StreetDrone ONE has a large number of complex hardware and software monitoring systems to ensure safe operation.</p> <p>If any warning systems are activated, the issues will be investigated and any faults rectified before activity can continue.</p>	3	1	3	No further action is necessary.					

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RISK MATRIX: (To generate the risk level).

Very likely 5	5	10	15	20	25
Likely 4	4	8	12	16	20
Possible 3	3	6	9	12	15
Unlikely 2	2	4	6	8	10
Extremely unlikely 1	1	2	3	4	5
Likelihood (L) ↑ Severity (S) →	Minor injury – No first aid treatment required 1	Minor injury – Requires First Aid Treatment 2	Injury - requires GP treatment or Hospital attendance 3	Major Injury 4	Fatality 5

ACTION LEVEL: (To identify what action needs to be taken).

POINTS:	RISK LEVEL:	ACTION:
1 – 5	NEGLIGIBLE	No further action is necessary.
6 - 10	MODERATE	Where possible, reduce the risk further
12 – 16	HIGH	Immediate action is necessary
20 - 25	INTOLERABLE	Stop the activity/ do not start the activity