spot. In the case of a bicycle or a kick scooter, it is also not possible for the central system to determine whether the vehicle is standing or lying down. Furthermore, it turns out that public authorities are only able to oppose such incivilities to a very limited extent and tend to prohibit this type of service, which penalizes managers of the service and users who behave appropriately.

It is therefore desirable to be able to remotely monitor the movements of movable objects. In the context of a self-service vehicle rental service, it may also be desirable to be able to ensure that the vehicles are returned at the end of rental to specific spots, and if possible, correctly stored in the case of a vehicle sharing system without reserved parking spots. It may also be desirable to monitor robots or drones in a delimited space, for example a goods storage shed, or to monitor access to a room or department by authorized persons, or even to broadcast a voice or video message to a person in a delimited place.

Summary

In an aspect, the present disclosure refers to a method for monitoring a remotely controllable member, the method comprising steps consisting in:

emitting a data signal by an electromagnetic radiation source (LS, LS1-LS21) by modulation of the electromagnetic radiation;

providing a receiver (S1, S21) of the electromagnetic radiation, the source and the receiver being coupled respectively to a fixed point and to a movable object (V1, V10) or vice versa;

providing a masking device (OS11-OS53) comprising one or several elements masking the electromagnetic radiation, the masking device being configured to limit an emission field of the source and/or a reception field of the receiver to a transmission area including the fixed point and defined by the masking device; and

when the receiver receives the data signal, implying that the receiver is located in the transmission area and oriented towards the emitter:

extracting data from the data signal by a processing unit (CU, CU1) connected to the receiver;

selecting by the processing unit a predefined command executable by the remotely controllable member, according to the extracted data without requiring a position calculation of the movable object;

transmitting the command by the processing unit to the remotely controllable member (CC, DV); and

executing the command by the remotely controllable member.

In another aspect, the present disclosure refers to a system for monitoring a remotely controllable member, the system comprising:

an electromagnetic radiation source (LS, LS1-LS21) emitting a data signal by modulation of the electromagnetic radiation,

a receiver (S1, S21) of the electromagnetic radiation, the source and the receiver being coupled respectively to a fixed point and to a movable object (V1, V10) or vice versa,

a masking device (OS11-OS53) comprising one or several elements masking the electromagnetic radiation, the masking device being configured to limit an emission field of the source and/or a reception field of the receiver to a transmission area including the fixed point and defined by the masking device, and

a processing unit (CU) configured to implement the method according to the above aspect.

Examples relate to a method for monitoring a remotely controllable member, the method comprising steps consisting in: transmitting a data signal between a movable object and a fixed point, the data signal being transmitted by an electromagnetic radiation source to a receiver of the electromagnetic radiation by modulation of the electromagnetic radiation, the source and the receiver being coupled respectively to the fixed point and to the movable object or vice versa; providing a masking device comprising one or several elements masking the electromagnetic radiation, the masking device being configured to limit a field of emission and/or reception of the data signal to a transmission area including the fixed point and defined by the masking device; extracting data from the data signal by a processing unit connected to the receiver; defining by the processing unit a command executable by the remotely controllable member, according to the extracted data, the position of the transmission area, and/or the orientation of the movable object; transmitting the command by the processing unit to the remotely controllable member; and executing the command by the remotely controllable member.

Thus, it is possible to remotely monitor one or several movable objects according to their position and orientation in space, or to trigger commands when the movable object is in a certain position defined as a function of the masking device.

According to one example, the method comprises steps consisting in: receiving by at least two receivers of a set of receivers installed on the movable object

two data signals transmitted by electromagnetic radiation emitted respectively by two fixed electromagnetic radiation sources, the field of emission and/or reception of the data signals emitted by each of the two sources being limited to a respective transmission area defined by a masking device; extracting, by the processing unit of the movable object connected to the set of receivers, an electromagnetic radiation source identifier from each received data signal; determining by the processing unit of the movable object connected to the set of receivers, a location area and a direction of a preferred axis of movement of the movable object in a plane of movement of the movable object, as a function of the identifiers of the two electromagnetic radiation sources and of the receivers having received the data signals, and executing by the processing unit, a command of an electromechanical member of the movable object as a function of the location area and the direction of the preferred axis of movement of the movable object.

In this way, it is possible to determine whether the movable object is precisely in a position and orientation defined by the masking device and to trigger the command only if this condition is met.

According to one example, the command belongs to a set of commands comprising: a command to limit the speed of the movable object, a command to stop the movement of the movable object, and a command to lock the movable object.

According to one example, the method comprises steps consisting in: determining by the processing unit whether the location area of the movable object is located in an authorized parking area of the movable object as a function of the emitter identifier, executing by the processing unit an end-of-use command when the location area is located in an authorized parking area, the end-of-use command comprising a command to lock the movable object, and a transmission to a remote server of an end-of-use notification message, containing a location data and an identifier of the movable object, and not executing by the processing unit the end-of-use command as long as the location area is not located in an authorized parking area.

According to one example, the movable object is located in an area comprising a plurality of data signal emitters, the method further comprising a step of determining a geographic position of the movable object as a function of the emitter identifier extracted from the signal received from one of the emitters.

According to one example, the data signal is emitted by modulating the supply current of an electromagnetic radiation source, belonging to the emission installation.

According to one example, the modulation of the supply current is of the SPWM type.

Examples may also relate to a device to be installed on a movable object, the device comprising: a receiver assembly comprising at least one electromagnetic radiation receiver, each receiver of the receiver assembly being associated with a respective masking device limiting an angle of incidence by which the receiver can receive the electromagnetic radiation, each masking device having a respective orientation, and a processing unit connected to the receiver assembly and to an interface to be linked to a control member of the movable object, the device being configured to implement the previously defined method.

According to one example, the receiver assembly comprises a front receiver block to be installed in a front position of the movable object and a rear receiver block to be installed in a rear position of the movable object, each of the front and rear receiver blocks being connected to the processing unit and bringing together several electromagnetic radiation receivers, the receivers of each of the front and rear receiver blocks being associated with respective masking devices having distinct orientations for capturing electromagnetic radiation having distinct orientations.

According to one example, the receiver assembly comprises an image sensor, the processing unit being configured to analyze images provided by the image sensor in order to determine the presence of an image area having a predefined color.

Brief description of the figures

The present invention will be better understood from the following description of exemplary embodiments, with reference to the appended figures, in which identical reference signs correspond to structurally and/or functionally identical or similar elements.

Figure 1 schematically represents an object emitting an electromagnetic field transmitting a data signal to a receiving object, according to one embodiment,

Figure 2 schematically represents a set of circuits installed in the receiving object, according to one embodiment,

Figure 3 schematically illustrates the case where the receiving object is located in the electromagnetic field emitted by the emitting object and another emitting object, according to one embodiment,