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(54) Title: ROBOTIC SYSTEM

(57) Abstract

A self–propelled robot is disclosed for movement over a surface to be treated. The robot has a power supply (11) and a pair of wheels (8,9) driven by motors (6, 7) for moving the robot over the ssurface. A mechanism (113, 115, 16) is provided for controllably depositing a fluent material onto the surface. Navigation sensors (4, 13, 18, 21) provide signals for enabling the robot to navigate over the surface and one or more detectors (14, 15, 17) detect the presence of the material on the surface and provide signals indicative of its presence. A control system (100) receives the signals from the sensors and detectors and controls the motors and the depositing mechanism in dependence upon the signals received from the sensors and detectors.

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ROBOTIC SYSTEM

The present invention relates to robotic systems and, more particularly to a mobile robotic system capable of movement over a surface and capable of treating the surface.

Conventionally robotic systems, or robots, of this type may be described as semi-autonomous, i.e. self-propelling but relying for navigational guidance on transmitters, receivers and sensors to establish a coordinate system by which the robot navigates, in effect learning the location of obstacles within its field of movement. More recently it has been proposed to allow a robot to move without establishing a coordinate system, instead relying on the sensing of *ad hoc* stimuli to enable the robot to navigate around obstacles. For example, it has been proposed to provide a robotic vacuum cleaner operating along these lines. Self-navigational robotic systems of this type are referred to as autonomous robots.

However, robots of these types, often intended for operation in a domestic environment, need a control system which is capable of allowing the robot to move around its environment in safety and therefore additionally need some sort of collision detection system which is capable of providing information on collisions or impending collisions to a control system capable of acting very quickly to prevent the collision or else to minimise the impact, and to perform collision avoidance by re-orienting the robot before further movement. Unfortunately, on-board processing power is inevitably limited by cost constraints in particular and therefore present systems, to avoid be prohibitively expensive, have relatively limiting navigational abilities which result, in use, in the robot tracing a path which involves passing over the same areas of the surface on plural occasions. Whilst this may not be problematic in say a vacuum cleaner, if the robot has the

function of treating the surface in other ways, then such redundant movement may result in over-treatment of the surface which is not only wasteful of the product used for the treatment (a serious problem where the payload is restricted), but may also damage the surface or otherwise actually be harmful.

The present invention is aimed at providing a self-propelled robot which can overcome such problems.

According to the present invention, there is provided a self-propelled robot for movement over a surface to be treated, the robot comprising

a power supply;

a traction mechanism receiving power from the power supply, for moving the robot over the surface;

a mechanism for controllably depositing a fluent material on to the surface;

a plurality of navigation sensors providing signals for enabling the robot to navigate over the surface;

one or more detectors adapted to detect the presence of the material on the surface and provide signals indicative thereof; and

a control system receiving the signals from the sensors and detectors, for controlling the traction mechanism and the depositing mechanism in dependence upon the signals received from the sensors and detectors.

By detecting the application of the fluent material, which may be a liquid or gaseous fluid or else a flowable powder, the over-application of material can be avoided or minimised by either navigating the robot around areas already treated and/or by controlling the depositing mechanism to stop the deposit of material over such previously treated areas.

Material for treatment is preferably contained within a reservoir on the robot and may comprise suitable compositions for treatment of floors, carpets and other floor coverings. The robot may, if desired, also include

means for cleaning the floor or floor covering prior to treatment, for example in the form of a vacuum cleaning device.

The invention also includes a method of treating a surface using a robot as defined above. The treatment method may be used for various applications on carpets, and other floor coverings, such as cleaning, protective treatment, for example for stain and soil protection, fire protection, UV protection, wear resistance, dust mite control, anti microbial treatment and the like, as well as treatment to provide an aesthetic benefit such as odorization/deodorization. The treatment method may also find application on other surfaces such as synthetic floor coverings, ceramics or wood. As well as polishing hard surfaces, the robot may also be used to apply coatings to either enhance aesthetics or to act as a protective layer.

Thus, according to a further aspect of the invention, there is provided a method for controllably depositing a fluent material on to floors, carpets and other floor coverings using an autonomous, self propelled, deposition-sensing robot. The material deposited may, for example, be a carpet cleaning composition, a hard surface cleaning composition, or one of a number of compositions applied simultaneously, or successively, and may include a marker, the presence of which can be detected to provide detection of the extent of treatment material deposition. Such a marker may have a limited detection life, for example, 12, 24 or 48 hours.

Non-visible treatment may also be provided by the robot of the invention, for example, for odour control, antibacterial action of dust mite control.

The robot preferably comprises a plurality of navigation sensors providing signals for enabling the robot to navigate over the surface, and one or more detectors adapted to detect the presence of the material on the surface and provide signals indicative thereof. The

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