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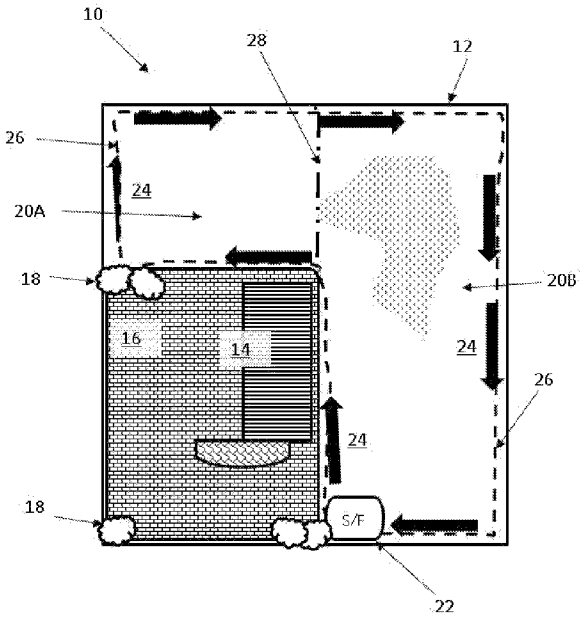

FIGURE 1

(57) Abstract: This invention relates to estimating the extent of a grassed area to be treated, such as an area of lawn for mowing and provides a method comprising identifying from location coordinates a bounded area to be mown and calculating the extent of the bounded area. The area is identified in an embodiment by causing a GPS-enabled device to be moved in relation to a perimeter of the area and recording its location co-ordinates at intervals, or in another embodiment, by marking on an aerial image of an area in which the area to be mown is located, the actual area requiring mowing. The marking may be done manually using a smartphone app or by the use of image recognition methods to distinguish the grassed area from its surrounds.

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METHOD AND APPARATUS FOR ESTIMATING A GRASSED AREA

Field of invention

[01] This invention relates to apparatus for and a method of estimating the extent of a grassed area to be treated, such as an area of lawn for mowing.

Background to the invention

[02] US granted patent no. 8126819, to Ersek, uses previously gathered images of a suburban plot of land, for use in reckoning mowing or other treatment services. Customers are required to post their estimate inquiry on a website associated with the service provider. Using current GPS satellite imaging aerial photographs of area lot sizes and customer demographic data stored in the lawn care service provider's database, a near real time estimate is provided for the estimate inquirer.

[03] Ersek's invention requires new customers to enter their demographic information and lot sizes into the lawn care service provider's system and obtain an estimate for the lawn care services by return. If the customer address is not in the lot size database (not shown) of the lawn care service provider but it is in a zip coded area that it services, then the customer will be so notified and requested to provide their own estimate for their yard size. Using that information, the service provider's system will provide an estimate for the type of lawn service that is requested.

[04] A pending application to Matthews, US20140229213-A1, mentions mowing services as an example, but requires a user to enter the lengths of two sides only, for determining an area to be mown.

[05] Both above systems can lead to considerable inaccuracies and the likelihood of a price being under-quoted or over-quoted, benefiting either the customer or the service provider unfairly.

Objects of the invention

[06] It is an object of this invention to address the shortcomings of the prior art and, in doing so, to provide a more accurate estimating system that does not rely on customer estimates.

[07] The preceding discussion of the background to the invention is intended to facilitate an understanding of the present invention. However, it should be appreciated that the discussion is not an acknowledgement or admission that any of the material referred to was part of the common general knowledge in Australia or elsewhere as at the priority date of the present application.

[08] Further, and unless the context clearly requires otherwise, throughout the description and the claims, the words 'comprise', 'comprising', and the like are to be construed in an inclusive sense - that is to say, in the sense of "including, but not being limited to" - as opposed to an exclusive or exhaustive sense - that is to say meaning "including this and nothing else".

Summary of invention

[09] According to a first aspect of the invention, there is provided a method of estimating an area of grass to be mown, the method comprising

a. Identifying from location coordinates a bounded area to be mown; and

b. Calculating the extent of the bounded area.

[010] In an embodiment of the invention, the step of identifying the bounded area comprises causing a GPS-enabled device to be moved in relation to a perimeter of the area and recording its location co-ordinates at intervals. A preferred device is a GPS-enabled smartphone.

[011] In performing the method, the device may be moved in a path corresponding to said perimeter, or in a known relationship to the perimeter. In an embodiment, the known relationship is a known distance from the perimeter. By way of a non-limiting

example, the distance may be 1 metre within the perimeter. In another example, the distance may be external to the perimeter, such as when the device is moved on a pathway surrounding a grassed area to be mown.

[012] In a preferred embodiment of the invention, the device comprises a processor that uses said co-ordinates in calculating the extent of a grassed area bounded by the perimeter.

[013] In a preferred embodiment of the invention, the method comprises the step of allowing the user to operate a software application ('app') for gathering location co-ordinates as the user progresses following the perimeter from a starting position and returning to said starting position.

[014] In a preferred form of the invention, the step of identifying the bounded area for mowing comprises:

a. Displaying to a service requestor an aerial image of a locality wherein lies a grassed area to be mown; and

b. Allowing the requestor to mark on the displayed image a plurality of points corresponding to points of the grassed area.

[015] The aerial image may be a satellite image, an aerial photograph or a map, or a combination of two or more thereof.

[016] In further preferred form of the invention, the processor is programmed to define a perimeter of the grassed area on the basis of the marked points.

[017] In an embodiment, the perimeter is defined to lie around the points.

[018] In an embodiment, the perimeter is defined by constructing a line between each pair of adjacent peripheral points. The respective lines in sequence define a polyline defining the perimeter of the area.

[019] Preferably, the method includes prompting input from the requestor to identify perimeter points.

[020] In an embodiment, the marking of points comprises shading in an area of the image corresponding to the grassed area to be mown.

[021] In a further preferred form of the method, the step of calculating the area comprises recording the geo-coordinates of the points marked.

[022] Preferably the method comprises applying an algorithm to determine from said geo-coordinates the extent of the bounded area.

[023] The method preferably further includes operating a programmed computer processor to calculate automatically the grassed area from the geo-coordinates.

[024] In a preferred embodiment according to this form of the invention, the processor calculates the area from a perimeter defined by the constructed lines.

[025] In an embodiment, the constructed lines are straight lines.

[026] In an alternative embodiment, the constructed lines are curves. The curves may be determined based on regression analysis performed on at least 3 marked points. Preferably, the points selected for regression analysis are consecutively located along the perimeter.

[027] In a preferred form of the invention, the method includes providing a user desiring a lawn-mowing service with a smartphone app that comprises executable instructions that, when run, will record GPS co-ordinates of a path followed by a user.

[028] Preferably the location co-ordinates are recorded at discrete intervals.

[029] In a preferred embodiment, the method comprises the step of allowing the user to operate the app for gathering location co-ordinates as the user progresses along the perimeter from a starting position and returning to said starting position.

[030] In an alternative preferred form of the invention, the step of marking the bounded area for mowing comprises:

a. Providing an aerial image of a locality that includes an address at which a grassed area to be mown is located.

b. Identifying a perimeter of the grassed area; and

c. Calculating the area enclosed by the perimeter.

[031] The method extends to the step of applying a monetary rate to the area calculated and generating a mowing price being the product of rate and area.

[032] In a still further preferred form of the invention, the method includes the step of adjusting the price on the basis of elevation data pertaining to the area.

[033] According to a third aspect of the invention, there is provided a mowing estimate-generating device comprising executable instruction code comprising an area-calculating algorithm, and a GPS-enabled smartphone on which the code is executable, the instruction code when run causing the smartphone to capture location co-ordinates defining a grassed area to be subjected to mowing, to execute said algorithm to generate an area estimate on the basis of the coordinates, and apply a monetary rate to the area estimate.

[034] Preferably, the instruction code comprises instructions for downloading the monetary rate from a remote server.

[035] Further preferably, the monetary rate is adjustable.

[036] In a preferred form of the invention, the monetary rate is adjustable according to slope of the grassed area.

Brief description of drawings

[037] In order that the invention may be readily understood, and put into practical effect, reference will now be made to the accompanying figures. Thus:

Figure 1 shows in schematic form a diagram of a yard to be mown according to an embodiment of the invention.

Figure 2 is a schematic diagram of a yard of the type in figure 1, involving the marking of a grassed area on an electronic image, according to a preferred embodiment of the invention.

Figure 3 is a schematic process diagram of the method of the invention according to a further preferred embodiment.

Detailed description of an embodiment of the invention

[038] In this invention, there are proposed three methods of capturing the extent of a user-defined location area [comprising a group of discrete points] for the purpose of determining a quantity associated with rendering a service in respect of the location area. For example, the quantity determined may be used for quoting the cost of mowing a defined grassed area, such as a lawn. Each method is discussed in detail below.

Method 1: GPS co-ordinate logging

[039] An app when run on a mobile GPS-enabled device of a user, such as a smartphone, interfaces with the GPS function to locate a user's location co-ordinates at a plurality of discrete points over time. In an embodiment of this method, the user is prompted to capture the co-ordinates of his location at a nominated starting point. The user is then prompted to walk around the perimeter of the area to be nominated for mowing. As he progresses, he is prompted to stop and click or tap an icon on the touch screen of the device, at which instant, the GPS co-ordinates are captured and read into the memory associated with the processor running the program.

[040] The app records the changes in the user's location over time, and plots the path the user followed. The method of operation is explained with reference to Figure 1 in which a location generally indicated by means of the numeral 10 is to be measured according to the invention. The location is defined by a boundary line 12, within which is a house 14 surrounded by a paved area 16 and occasional shrubbery 18. The remainder of the bounded locality 10 is made up of a lawn 20.

[041] The invention is implemented by a user downloading the application supplied by a lawn service provider or a service platform with which the provider is associated. This may be accomplished and organised in various different ways prevalent in commerce, using a job portal to introduce suppliers to customers. The user may be desirous of having his lawn mown and may already have approached a service provider which has introduced him to the app and directed him to download it to enable business to proceed, or he may be seeking a service provider and may have downloaded the app to estimate his lawn area before submitting the measurements to a service provider interactively listed on, or proposed by, the app.

[042] It will be assumed for this embodiment that the app user is the owner or lessor occupying bounded location 10 and is desirous of engaging a lawn mowing service provider. It will be appreciated that the user may be an agent of the occupier, or even a servant of the service provider, summoned to the location to provide an on-site measurement.

[043] The user, having arrived at the site, being locality 10, opens the app and is receives an on-screen prompt to move to a starting point on the perimeter of the area 20 to be mown. The starting point is represented by location marker 22 in Figure 1. When the user is in position at his chosen starting point 22, he taps an icon marked 'Start Measuring' (or similar). The smartphone processor then interrogates the on-board GPS function and records the instantaneous location co-ordinates of the user's position. The smartphone display displays a message to the effect of inviting the user to move along the perimeter of the area to be mown and to hit a stop button when he returns to starting point 22. The user will then perambulate in the direction of the black directional arrows 24, around the outer extent of lawn 20, as represented by broken line 26 until arriving back at point 22, at which juncture he will tap a demarcated 'stop' icon to stop the recording of his instantaneous location co-ordinates.

[044] While the smartphone is moving along perimeter 26 borne by its user, the processor records the changing location co-ordinates and plots out the path being followed.

[045] Preferably, however, the processor will compare co-ordinates as the user progresses and compare them with the co-ordinates of the starting point, thereby detecting when the end point has probably been reached, based on the difference between the current co-ordinates and the co-ordinates of the starting point returning to a minimum value not seen since the movement began. When the difference detected is less than a preset minimum, it is assumed the user has arrived at the end of the perimeter. The processor causes an alert tone to be sounded and an alert to be visually displayed, requesting confirmation from the user that the measurement has ended. A prompt will show, requesting the user whether there is a further area to be added, or whether there is an area to be excluded, for example if there is a non-grassed area such as a rockery, shade tree, swimming pool, or fishpond. The user may respond by tapping a button to indicate nothing more to add, or a second button to add or subtract an area. In the latter case, the process will be repeated, with the user being invited to move to a new starting point, and so on.

[046] Once the area to be mown has been defined by its perimeter 26, an algorithm is applied for calculating the area thereby enclosed. The algorithm may be one that employs geometrical formulae or be structured to divide an irregularly shaped grassed area into two or more areas of recognized geometrical shape. Hence in the case of lawn 20 in Figure 1, the lawn perimeter as traced may first be smoothed into a series of linked straight lines, eliminating in accuracies arising from inconsistencies in the direction of the user's gait. Thereafter, the app causes the processor to recognise the area 20 as two separable rectangles 20A and 20B, divided by broken line 28 (for example).

[047] In more irregularly shaped lawns, such as those with curved boundaries, the algorithm may employ integration or similar calculus-based techniques, or a combination of techniques involving dividing the lawn into small fragments of known area and adding the areas of the fragments to arrive at an aggregate representing a close approximation of the area of the whole lawn. As indicated previously, the areas of non-mowable zones within the main perimeter 26 may be similarly calculated and then subtracted from the whole to arrive at the total mowable area within boundary 12.

[048] In a variation of the method of the above embodiment, the user walks around and across the lawn he wants to have mowed, having the app record his location co-ordinates at various places as he moves around. The app runs an algorithm to propose a perimeter around the various points recorded. This perimeter is displayed to the user, superimposed on an image of the premises and the user is requested to indicate approval or otherwise of the area enclosed by the perimeter.

Method 2: Satellite imagery measurement

[049] In this embodiment, the app, when run on a PC, smartphone or tablet device associated with the user, utilises satellite imagery to display a user-defined location, responsive to the user entering a street address or longitude and latitude coordinates. The user then marks points on the perimeter or on the grassed area, using their finger on a touch screen, or a pointing device including a mouse, to define the area they wish to have mowed and quoted on.

[050] In the case where the grassed area is to be defined by means of its perimeter, the user is prompted to click on any point of the display, but ideally one that appears at least to be proximate the perimeter, to define a starting point and thereafter to click further points located along the perimeter of the lawn area being displayed. Each point functions as a pivot or vertex point, so that the next selected point references that previous point as a continuation of the perimeter. The user finishes defining the area to be mown by returning to the starting point. The perimeter thus defined is made up of a connected sequence of line segments, referred to as a 'polyline'.

[051] For example, a square-shaped backyard lawn area would require the user to select five points in sequence, the fifth point being back at and corresponding to the starting point.

[052] Figure 2 illustrates the implementation of the method in the backyard layout of Figure 1, as shown on a touchscreen display 40. Like parts are denoted by like numerals. Again, let the numeral 22 signify the starting point where the user initially taps on the touchscreen display in response to a prompt in the message zone 42. The user is directed

in the prompt zone to tap a second point on the screen, that coincides with the perimeter in the image. The user decides to progress around the perimeter in a clockwise direction and taps at position 44. The line constructed between the starting position and position 44 defines a first segment of the perimeter. The user receives a prompt to tap a third point and does so at 46.

[053] At this juncture, three points on the perimeter have been designated – enough for the process to act on programmed instructions and display a zone defined by lines constructed from the starting position 22, and subsequent positions 44 and 46. As the reader will appreciate, the triangle defined by these three points covers most of building roof 14, instead of any significant area of lawn. The user is prompted to confirm the area, or add a further point. The user proceeds to add a point by tapping at position 48. Again the program endeavours to have the processor make sense of the positions tapped and proposes, by way of a further display and prompt, the four-sided zone defined from starting point 22, to position 44, then to position 48, to position 46 and back to position 22. This zone also does not correspond with the lawn, and the user, when prompted, taps at position 50, repeats the process again at 52 and then taps at the starting point 22 again. The prompt zone displays an observation that the starting point appears to have been reached and asks whether the definition of the lawn has been completed. It may also request the user to indicate whether further points are to be entered.

[054] If the user responds that the lawn perimeter definition is complete, the algorithm of the program makes an assumption concerning the position of the lawn area and requests confirmation (yes/no) from the user. The assumption made is based on the direction defined by the sequence of points touched by the user. In the embodiment described, the user has progressed in a clockwise direction and has closed the loop so formed. The algorithm thus works on the assumption that the area to be mown is within the bounded area.

[055] In the situation where the user is defining an area to be excluded from mowing (for example a rose garden or a rockery), the opposite assumption will be applied.

[056] In a refinement of this embodiment, the processor is instructed to prompt the user, after the first segment of the perimeter has been defined (between the starting point and position 44), to indicate whether the lawn zone lies to the left or to the right of that segment. When enough perimeter points have been designated and a position has been reached from which a straight line is able to be constructed to the starting position without intersecting any earlier segment – as seen in the case of the broken line 54 - the user is prompted for confirmation that a mow zone has been defined and is requested to confirm that no more points are to be added.

[057] In the example shown in Figure 2, a straight line, as contemplated immediately above, would be able to be constructed from a point to the right of the point of intersection of the segment from position 48 to 50, and the line extended from position 22 through position 44. In this example, the user would receive the prompt regarding completion of the lawn area when he taps on position 50. Temporary line 54 would then be constructed by the processor and displayed on the screen. The user is prompted to tap the end point to confirm the end of the perimeter defining phase, or to tap somewhere else on the lawn perimeter, preferably continuing in a clockwise sequence.

[058] The enclosed area within the polyline perimeter defines the main area to be mowed/quoted.

[059] If there is an area within the polyline perimeter to be excluded from the quote, for example feature 56 in Figure 2, representing a fishpond, the user is prompted by means of a menu display to define it, or to define additional areas to be included, or to submit the area already defined for an instant quote.

[060] In the case of area 56 to be excluded, the user selects the appropriate menu item and is then invited to point to any point on the perimeter of the excluded area (which should - and in this case certainly does - lie within the perimeter of the main area 12 already defined). As in the case of the main area, the user is prompted to indicate a second point and then to indicate whether the area to be excluded is located to the left/right or top/bottom of the segment by the first and second points.

[061] As before, each position tapped by the user is converted to a set of geo-spatial location co-ordinates, from which data, distances and areas are calculated, employing trigonometric and calculus-based methods. The area of excluded area 56 is then subtracted from the area calculated earlier and the difference is multiplied by a cost rate per unit area to arrive at a monetary proposal.

[062] Further variables may be requested from the user, for inputting to the processor before the quote is issued. By way of non-limiting example, the user may define the length or shortness of the cut, or the frequency of required mowing, such as weekly, fortnightly or at intervals of a specified number of days. Further parameters may also be set – such as a date range. Concurrent treatments such as fertilizer spreading and topsoil distribution may be included as requirements, using the same area measurements.

[063] In the above polyline method of defining a perimeter, in which the need to click back on the starting position to establish the finish point is avoided, any point added (after the 2nd point) to define a further line segment to the polyline will be automatically assumed to be the final point requiring definition. The final point is to be distinguished from the finish point, which coincides with the starting position, and serves to close the loop formed by the polyline. A temporary line segment is then constructed from the assumed final point back to the starting position, to enclose the area within the perimeter defined by the polyline. The user will be prompted to confirm the polyline segment thus constructed.

[064] In an alternative embodiment of this second method of marking the mow zone, the app provides instructions for accepting input on the form of brush-like strokes from the user, which have the effect of shading in a grassed area on a relevant aerial image. Once the user has finished shading the area, he taps a button to communicate this to the processor running the app. In response, the app will cause a prompt to appear, requesting the user similarly to shade out any areas to be excluded from the shaded area.

[065] Further, in the embodiments above, there may be included altitude data associated with the recorded or captured co-ordinates, so that the slope of the terrain to

be mowed is calculable. With this data, the true surface area to be mown is more accurately ascertainable. The service provider is also in a position to adjust the rated price according to the steepness of the slope of the ground to be mown, as this influences the fuel consumption and time to be allocated to the job in question.

Method 3: Artificially Intelligent grass and obstacle detection

[066] Artificial intelligence features in the application interface with satellite imaging to detect, recognize and capture grassed areas to be mown, using address data supplied by a customer.

[067] With reference to Figure 3, the invention extends to the use of application software to cause a processor to interpret image data obtained of a general locality at which a mowing task is required. In this embodiment, the user submits at step 102 a request for a quotation (RFQ), providing the address of the premises where the service is required.

[068] A system server uses the address to stream or download an aerial view or satellite image (104) of the locality to the user device. A supplier of suitable images is known under the trade name Google Maps. The image shows the property in the context of its surrounds, for example at a suburban block level. The number of blocks shown would depend on the size of the blocks. Generally, the image should be selected to cover about 4km^2. The size should suit the context of the address and should show a number of surrounding properties and their lawns.

[069] At 106, the processor executes instructions provided by the app and makes a prediction as to the perimeter of the lawn area to be mown. This will be put to the customer in a proposal, including a quoted price for the service to be provided. To arrive at this outcome, it performs a programmed algorithm to analyse the aerial image. In doing so, it detects colours, patterns and inconsistencies 108. It zooms in digitally on the address given in the RFQ and seeks out features, testing them against images contained in an image library 110 and corresponding to objects such as fences, roads, trees, paths, buildings and dams, etc. From the surrounding environs, it determines probable

characteristics of the property being quoted on and determines a proposed perimeter of the lawn to be mowed. The proposed perimeter would include internal perimeters determined to surround identified obstacles 114 in the overall expanse of lawn.

[070] The system software also programs the processor to perform colour recognition in respect of lawns in the vicinity of the premises 112. The programming instructions cause colours within the predicted perimeter to be recorded and differences noted. A steep colour gradient, exceeding a predefined threshold, indicates a change in terrain. By applying logic further, the program causes the processor to identify the colour of the lawn of the locality, by determining the predominant colour of the designated greater area, and colour-matching it to colours of images from other known or recognized areas of lawn in the vicinity. Images of these comparable lawns and of the premises in question would preferably have been recorded on the same recording occasion to eliminate differences that may have developed over time.

[071] An example of a system of mapping and imaging that is suitable for use in the present invention is the 'Google Earth' system. Further assumptions that may be applied in performing the image comparison include:

a. That the perimeter of the outermost area (when there are two or more areas) is immediately adjacent the grassed area to be mown.

b. That the grassed area corresponds predominantly to a green shade (if the shade is too yellow or brown, then probably insufficient grass exists for mowing).

[072] From its calculations, the processor provides the perimeter to be proposed for mowing, including exclusion zones, and superimposes these on an enlarged aerial image of the premises 116. It causes the combined superimposed image to be displayed to the user and prompts the user to approve the area demarcated (see step 118).

[073] Slope data is preferably included in the data characterizing the locality to be mown. As discussed previously, the altitude profile of the area to be mown has influence

on numerous variables that should be taken into account in preparing a quote for a customer.

[074] Any suitable device may be employed by the user for downloading and executing the app used in the invention, but particularly convenient are touchscreen enabled mobile computing devices. This is not to exclude the use of a device having an optical tracking device such as a mouse for identifying locations on the display.

[075] When the image of his property is displayed to him 118, the user is prompted to approve the representation of the lawn area perimeter as identified, or to adjust the mowable area by tapping or clicking (as the case requires) and dragging on points of the perimeter, such as corners. The user will also approve exclusion areas as previously described, as a part of the requirements of this step 120.

[076] When the user has signalled satisfaction with the representation of the mowing area and the price, he will be invited to accept a quote 122 for a price calculated on the basis of the area within the approved perimeter. Finally, at step 124, the user signals his acceptance or rejection of the quote and this is communicated via the app on the user device to the server of the service provider.

[077] The present invention thus provides quoting tools directly to the end-user. In use, these tools provide instant pricing output, without need for manual intervention by or review from the service provider or his agent.

[078] These embodiments merely illustrate particular examples of the system and method of the invention for the determination of a grassed area area to be mown. With the insight gained from this disclosure, the person skilled in the art is well placed to discern further embodiments by means of which to put the claimed invention into practice.

CLAIMS

1. A method of estimating an area of grass to be mown, the method comprising

    a. Identifying from location coordinates a bounded area to be mown; and

    b. Calculating the extent of the bounded area.

2. A method according to claim 1 wherein the step of identifying the bounded area comprises causing a GPS-enabled device to be moved in relation to a perimeter of the area and recording its location co-ordinates at intervals.

3. A method according to claim 2 including moving the device in a known relationship to the perimeter.

4. A method according to claim 3 wherein the known relationship is a known distance from the perimeter.

5. A method according to claim 4 wherein the distance is within the perimeter.

6. A method according to any one of claims 2 to 5 wherein the device comprises a processor that uses said co-ordinates in calculating the extent of a grassed area bounded by the perimeter.

7. A method according to any one of claims 2 to 6 comprising allowing the user to operate a software application for gathering location co-ordinates as the user follows the perimeter from a starting position and returns to said starting position.

8. A method according to claim 1 wherein the step of identifying the bounded area for mowing comprises:

    a. Displaying to an app user an aerial image of a locality wherein lies a grassed area to be mown; and

    b. Allowing the requestor to mark on the displayed image a plurality of points corresponding to points of the grassed area.

9. A method according to claim 8 wherein the aerial image is a satellite image, an aerial photograph or a map, or a combination of two or more thereof.

10. A method according to claim 8 or claim 9 wherein the processor is programmed to define a perimeter of the grassed area on the basis of the marked points.

11. A method according to claim 10 wherein the perimeter is defined to lie around the points.

12. A method according to claim 11 wherein the perimeter is defined by identifying peripheral points from those marked and constructing a line between each pair of adjacent peripheral points so that the respective lines in sequence define a polyline.

13. A method according to any one of claims 10 to 12 comprising prompting input from the requestor to identify perimeter points.

14. A method according to claim 8 wherein the identifying of points comprises shading in an area of the image corresponding to the grassed area to be mown.

15. A method according to any one of claims 8 to 14 wherein the step of calculating the area comprises recording the geo-coordinates of the points identified.

16. A method according to claim 15 comprising applying an algorithm to determine from said geo-coordinates the extent of the bounded area.

17. A method according to claim 16 including operating a programmed computer processor to calculate automatically the grassed area from the geo-coordinates.

18. A method according to claim 12 or 13 wherein the processor calculates the area from a perimeter defined by the constructed lines.

19. A method according to claim 18 wherein the constructed lines are straight lines.

20. A method according to claim 18 wherein the constructed lines are curves.

21. A method according to claim 20 wherein the curves are determined on the basis of regression analysis performed on at least three marked points.

22. A method according to claim 1 that comprises providing a user desiring a lawn-mowing service with a smartphone app that comprises executable instructions that, when run, will record GPS co-ordinates of a path followed by a user.

23. A method according to claim 22 wherein the location co-ordinates are recorded at discrete intervals.

24. A method according to claim 23 comprising the step of allowing the user to operate the app for gathering location co-ordinates as the user progresses along the perimeter from a starting position and returning to said starting position.

25. A method according to claim 1 wherein the step of marking the bounded area for mowing comprises:

    c. Providing an aerial image of a locality that includes an address at which a grassed area to be mown is located,

    d. Identifying a perimeter of the grassed area, and

    a. Calculating the area enclosed by the perimeter.

26. A method according to claim 25 extending to the step of applying a monetary rate to the area calculated and generating a mowing price being the product of rate and area.

27. A method according to claim 26 comprising the step of adjusting the price on the basis of elevation data pertaining to the area.

28. A mowing estimate-generating device comprising executable instruction code comprising an area-calculating algorithm, and a GPS-enabled smartphone on which the code is executable, the instruction code when run causing the smartphone to capture location co-ordinates defining a grassed area to be

subjected to mowing, to execute said algorithm to generate an area estimate on the basis of the coordinates, and apply a monetary rate to the area estimate.

29. A device according to claim 28, wherein the instruction code comprises instructions for downloading the monetary rate from a remote server.

30. A device according to claim 28 or claim 29, wherein the monetary rate is adjustable.

31. A device according to claim 30, wherein the monetary rate is adjustable according to the slope of the grassed area.

END

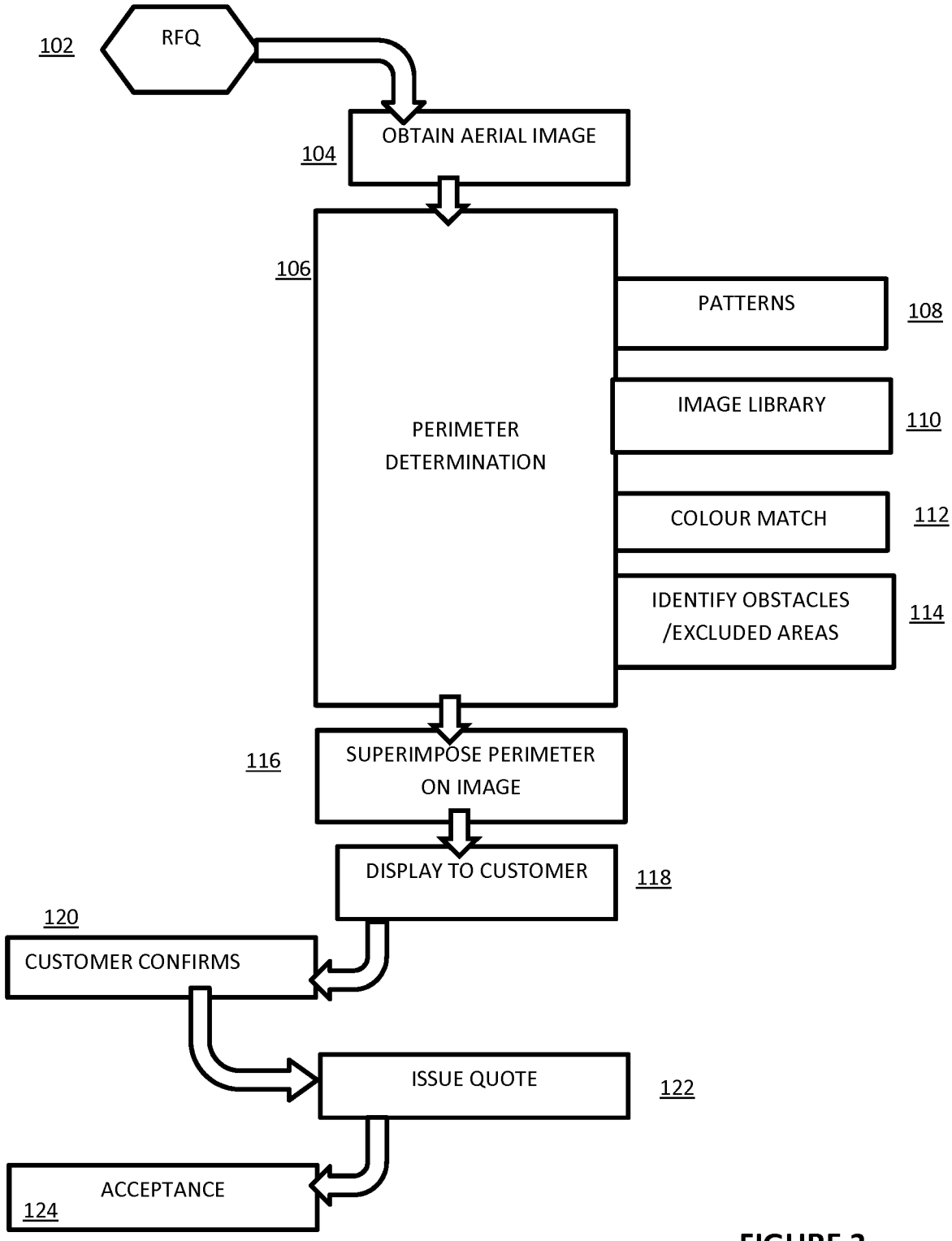
102
RFQ
104
OBTAIN AERIAL IMAGE
106
PERIMETER DETERMINATION
PATTERNS
108
IMAGE LIBRARY
110
COLOUR MATCH
112
IDENTIFY OBSTACLES /EXCLUDED AREAS
114
116
SUPERIMPOSE PERIMETER ON IMAGE
DISPLAY TO CUSTOMER
118
120
CUSTOMER CONFIRMS
ISSUE QUOTE
122
ACCEPTANCE
124

FIGURE 3

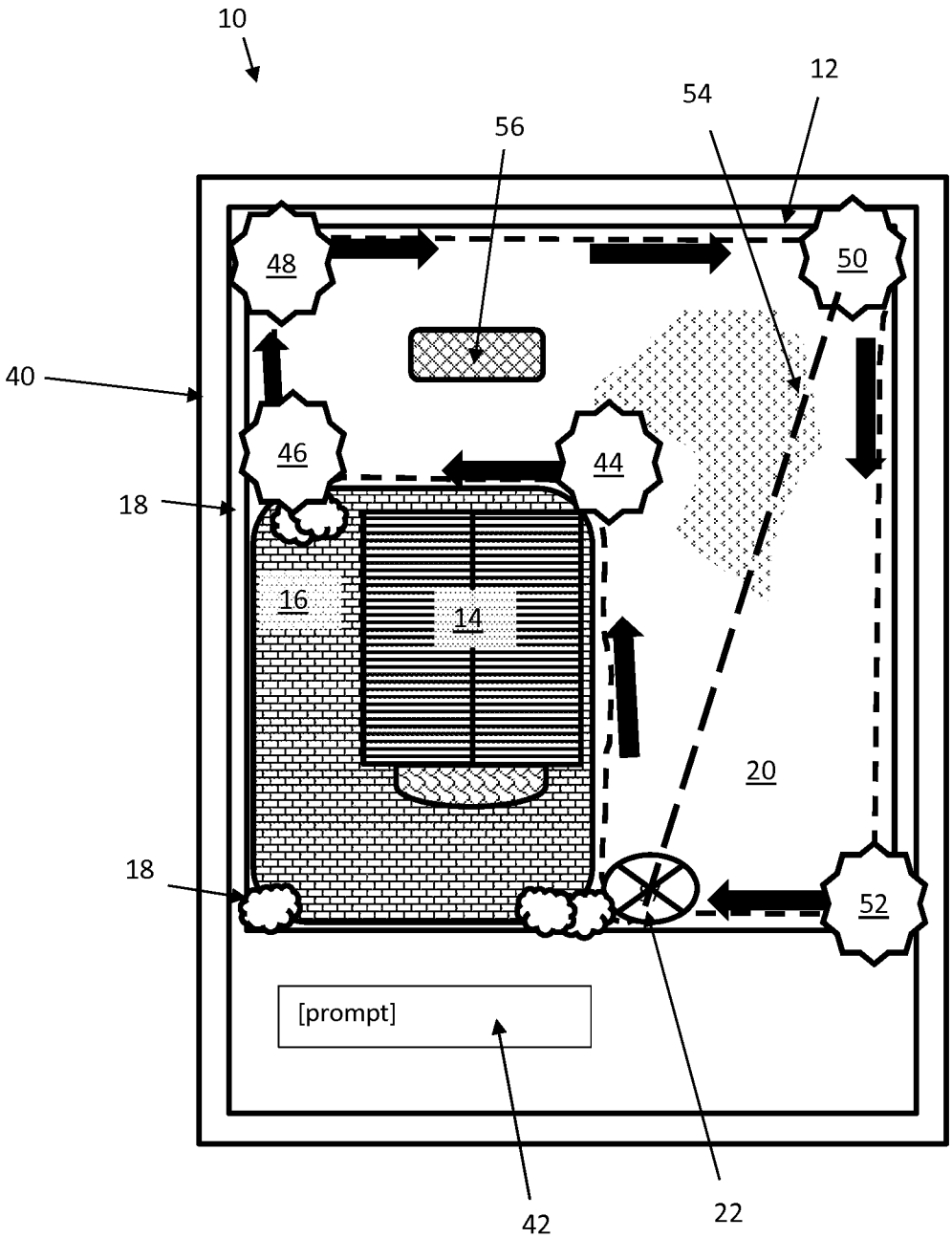

FIGURE 2

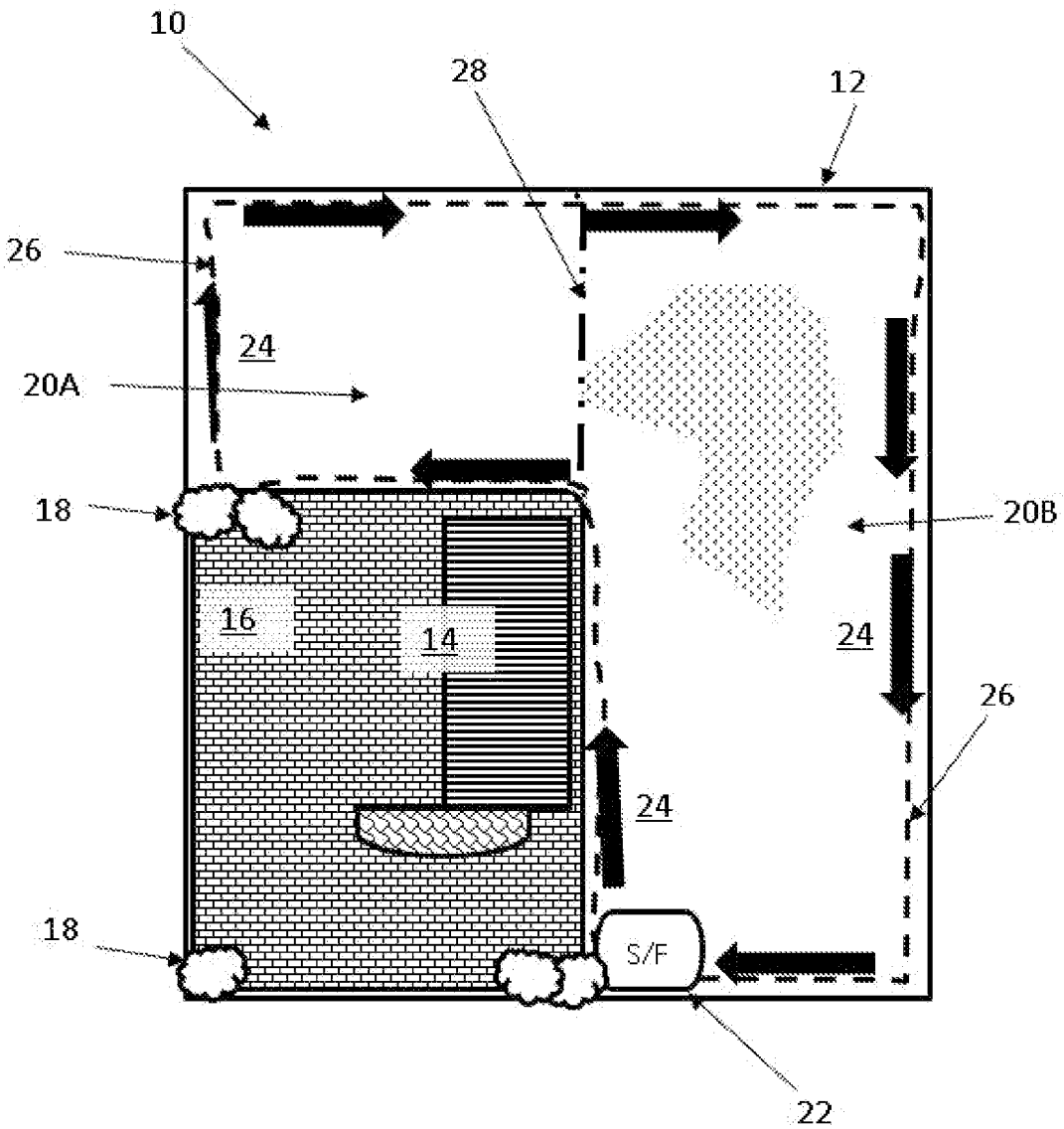

FIGURE 1

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB2017/050755

A. CLASSIFICATION OF SUBJECT MATTER

G01C 7/02 (2006.01) G01C 22/00 (2006.01) G01S 19/38 (2010.01) G06Q 50/02 (2012.01)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

epodoc: cpc g01c7/02, g01c22/00, g01s19/38, g06q50/02 & keywords (gps location, coordinate, record, determine, identify, mark, area, map, layout, perimeter, boundary, fence, distance, length, offset, besides, in parallel follow trace, slope, incline, gradient, angle, slant, estimate, calculate) & like terms; wpiap, epodoc: ipc g01c7/02, g01c22/00, g01s19/38, g06q50/02 & keywords (gps location, coordinate, record, determine, identify, mark, area, map, layout, perimeter, boundary, fence, distance, length, offset, besides, in parallel follow trace, slope, incline, gradient, angle, slant, estimate, calculate determine track, point polygon) & like terms; txte: keywords (gps location, coordinate, record, determine, identify, mark, area, map, layout, perimeter, boundary, fence, distance, length, offset, besides, in parallel follow trace, slope, incline, gradient, angle, slant, estimate, calculate determine track, point polygon cost price grass lawn plant vegetation) & like terms; espacenet: ipc a01b a01c g01c g01s g06q50 g01c7/02 g01c22/00 g01s19/38 & keywords (mobile phone area lawn mowing polygon perimeter boundary fence offset gps area boundary); google scholar, keywords (gps lawn cost area walk next fence perimeter); google play store , keywords (gps area); ip Australia internal databases, espacenet: inventor & applicant name.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
	Documents are listed in the continuation of Box C	

[X] Further documents are listed in the continuation of Box C [X] See patent family annex

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
15 May 2017	15 May 2017
Name and mailing address of the ISA/AU	**Authorised officer**
AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA Email address: pct@ipaustralia.gov.au	Peter Garay AUSTRALIAN PATENT OFFICE (ISO 9001 Quality Certified Service) Telephone No. +61262832451

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB2017/050755

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:

because they relate to subject matter not required to be searched by this Authority, namely:

the subject matter listed in Rule 39 on which, under Article 17(2)(a)(i), an international search is not required to be carried out, including

2. ☐ Claims Nos.:

because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos:

because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a)

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

See Supplemental Box for Details

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:
1-7, 22-24, 28-31

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		International application No. **PCT/IB2017/050755**
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 8126819 B1 (ERSEK) 28 February 2012 The whole document, especially abstract, fig 1B	1
X	PATTON A, 'Practical Math for the Turfgrass Professional', The University of Arkansas Division of Agriculture, Cooperative Extension Service, Fayetteville (2008) pages 2-17	1-7
X L	Google Play Store: 'AgroidPro GPS Area Measure' and other apps, [retrieved from internet on 28 April 2017] < URL: https://play.google.com/store/apps/details?id=b4a.agroid_pro > The whole document, especially the description The archive version of the page showing that the application was available before the priority date does exist but does not render properly	1-7, 22-24, 28-31
X	US 6532672 B1 (GOTTLIEB) 18 March 2003 The whole document, especially abstract	1-7
X	US 2003/0220734 A1 (HARRISON et al.) 27 November 2003 The whole document, especially abstract, fig 18, §0032 0064	1-3, 6, 7
X	CN 201463854 U (BEIJING ACAD AGRIC & FORESTRY) 12 May 2010 Abstract	1-7, 28-31
A	NJUGUNA E. C., 'Land-Use / Land-Cover Mapping GPS Methodology', CIRAD 2003, [retrieved from internet on 5 May 2017] < URL: http://agritrop.cirad.fr/576775/1/NJUGUNA-2003-GPS%20methodology.pdf > pages 8-11	7, 23, 24
A	US 2014/0258201 A1 (QUALCOMM INCORPORATED) 11 September 2014 The whole document	

Supplemental Box

Continuation of: **Box III**
This International Application does not comply with the requirements of unity of invention because it does not relate to one invention or to a group of inventions so linked as to form a single general inventive concept.

This Authority has found that there are different inventions based on the following features that separate the claims into distinct groups:

- Claims 1-7, 22-24, 28-31 are directed to conducting a site survey for area determination. The feature of identifying from location coordinates a bounded area, calculating the extent of the bounded area by the use of a GPS coordinates is specific to this group of claims.

- Claims 8-21 are directed to determination of an area by making markings on aerial imagery. The feature of identifying from location coordinates a bounded area, calculating the extent of the bounded area by displaying to an app user an aerial image of a locality wherein lies a grassed area to be mown; and allowing the requestor to mark on the displayed image a plurality of points corresponding to points of the grassed area is specific to this group of claims.

- Claims 25-27 are directed to determination of an area by identifying an are based the content of an aerial image. The feature of identifying from location coordinates a bounded area, calculating the extent of the bounded area by providing an aerial image of a locality that includes an address at which a grassed area to be mown is located, identifying a perimeter of the grassed area, and calculating the area enclosed by the perimeter is specific to this group of claims.

Note: These three groups also appear to correspond "Method 1", "Method 2", "Method 3" in the description.

PCT Rule 13.2, first sentence, states that unity of invention is only fulfilled when there is a technical relationship among the claimed inventions involving one or more of the same or corresponding special technical features. PCT Rule 13.2, second sentence, defines a special technical feature as a feature which makes a contribution over the prior art.

When there is no special technical feature common to all the claimed inventions there is no unity of invention.

In the above groups of claims, the identified features may have the potential to make a contribution over the prior art but are not common to all the claimed inventions and therefore cannot provide the required technical relationship. The only feature common to all of the claimed inventions and which provides a technical relationship among them is:

identifying from location coordinates a bounded area and

calculating the extent of the bounded area.

However this feature does not make a contribution over the prior art because it is disclosed in: US 8,126,819 B1 (ERSEK) published on Feb. 28, 2012; see abstract, fig 1B (and would also be considered common general knowledge).

Therefore in the light of this document this common feature cannot be a special technical feature. Therefore there is no special technical feature common to all the claimed inventions and the requirements for unity of invention are consequently not satisfied *a posteriori.*

INTERNATIONAL SEARCH REPORT Information on patent family members	International application No. **PCT/IB2017/050755**

This Annex lists known patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document/s Cited in Search Report		Patent Family Member/s	
Publication Number	**Publication Date**	**Publication Number**	**Publication Date**
US 8126819 B1	28 February 2012	US 8126819 B1	28 Feb 2012
US 6532672 B1	18 March 2003	US 6532672 B1	18 Mar 2003
		AU 5123701 A	15 Oct 2001
		EP 1285219 A2	26 Feb 2003
		WO 0175392 A2	11 Oct 2001
US 2003/0220734 A1	27 November 2003	US 2003220734 A1	27 Nov 2003
		US 7054741 B2	30 May 2006
		US 2002198736 A1	26 Dec 2002
		US 7171389 B2	30 Jan 2007
		US 2006125828 A1	15 Jun 2006
		US 7356406 B2	08 Apr 2008
		US 2008130955 A1	05 Jun 2008
		US 7580045 B2	25 Aug 2009
		US 2005116966 A1	02 Jun 2005
		US 2006197763 A1	07 Sep 2006
		US 2007112936 A1	17 May 2007
		US 2007226004 A1	27 Sep 2007
		US 2010289642 A1	18 Nov 2010
		US 2010289822 A1	18 Nov 2010
		US 2010293193 A1	18 Nov 2010
		US 2010293282 A1	18 Nov 2010
		US 2010293485 A1	18 Nov 2010
		US 2010293620 A1	18 Nov 2010
CN 201463854 U	12 May 2010		
US 2014/0258201 A1	11 September 2014	US 2014258201 A1	11 Sep 2014
		CN 105008959 A	28 Oct 2015
		EP 2965118 A1	13 Jan 2016
		JP 2016516979 A	09 Jun 2016

Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.

INTERNATIONAL SEARCH REPORT Information on patent family members	International application No. **PCT/IB2017/050755**

This Annex lists known patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document/s Cited in Search Report		Patent Family Member/s	
Publication Number	**Publication Date**	**Publication Number**	**Publication Date**
		WO 2014137547 A1	12 Sep 2014

End of Annex

Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.