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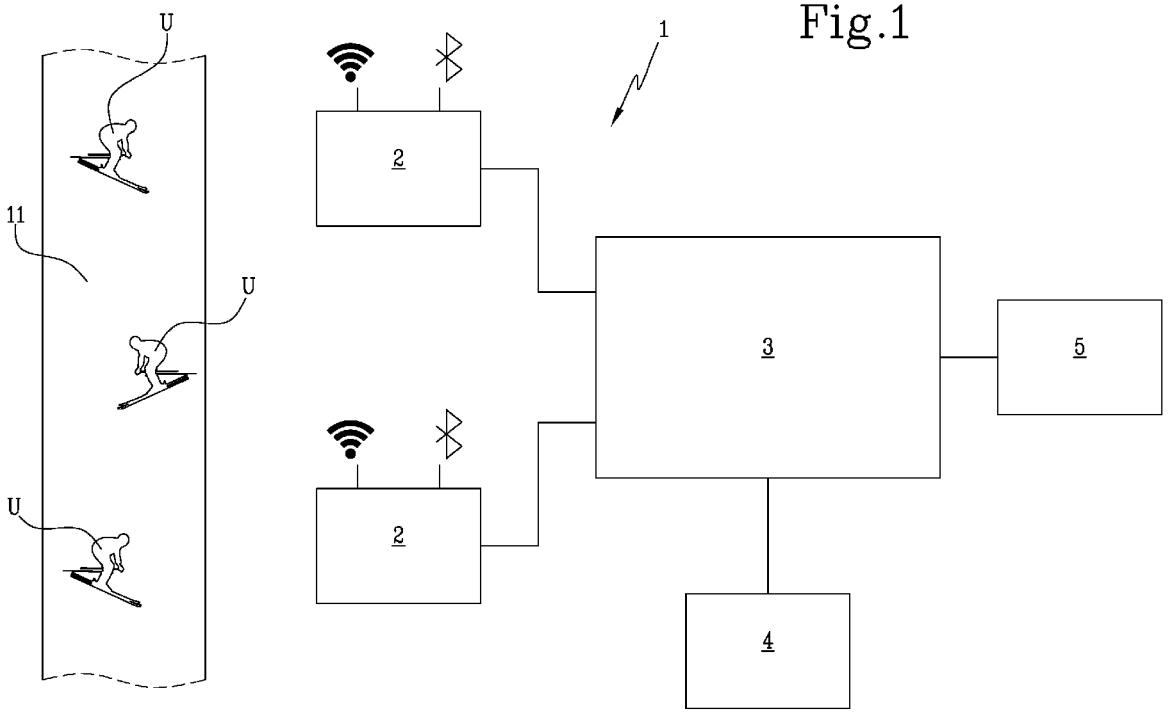
(54) **A DETECTION SYSTEM AND METHOD FOR DETECTING USERS FOR A SKI AREA**

(57) Detection system (1) for detecting users (U) for a ski area (10) comprising at least one ski slope (11) and at least one ski lift (12). The system (1) comprises at least one detection device (2) of the passage of users (U) arranged along the ski slope (11) and configured to generate and send a detection signal representative of the passage of a user interface device near the detection device (2) itself in a given moment or time interval and a control unit (3) configured to communicate with the detection device (2) to receive the detection signals so as to define a database (4) representative of a number of users who have used the ski slope (11) in given moments or time intervals.

Fig.1



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Description

Technical field

[0001] The present invention relates to a system and method for detecting users in a ski area.

[0002] That is, the present invention belongs to the ski sector and in particular to the sector of monitoring ski slopes in systems.

[0003] To date, it is particularly important to know the number of people in transit among the different ski slopes in order to properly plan the management of the systems themselves.

Prior art

[0004] In order to achieve such a result, however, there are several methods which are imprecise or impractical.

[0005] A first method envisages an estimate which can be made based on the number of ski passes sold and used at the access to the ski lifts, detected by applying statistical methods to evaluate the use of the different ski lifts and thus which slopes are more crowded. However, such a method is not very precise as it does not allow to know the actual number of users who travel the ski slopes or the times or the number of times the slope has been travelled. Furthermore, a single ski lift can serve two or more ski slopes and therefore is not representative of the actual use of the individual slopes.

[0006] A further method envisages an estimate which can be based on the use of dedicated apps (software applications) installed on users' smartphones. However, such an estimate is not very effective because it is difficult to convince users to install and activate the app on their personal device in addition to the fact that the GPS signal is not always present along mountain slopes. Without a certain number of users with the app installed, it is in fact not possible to obtain an accurate estimate and further analyses would be necessary.

[0007] A further method envisages counting people by using optical sensors such as cameras. An optical sensor such as a camera has the disadvantage related to the strong impact of atmospheric conditions. For example, in the event of fog, ice formation on the camera or unfavourable daylight, the camera may not be able to obtain the data necessary for effectively counting people. Furthermore, problems related to the protection of personal data may arise.

Objects of the present invention

[0008] The technical task of the present invention is thus to provide a detection system and a method for detecting users in a ski area which are able to overcome the prior-art drawbacks which have emerged.

[0009] The object of the present invention is therefore to provide a detection system and method for detecting users in a ski area which allow for an effective counting of people on the ski slope.

[0010] A further object of the present invention is therefore to provide a system and a method for detecting users in a ski area which allow to improve the management of the ski area.

[0011] The defined technical task and the specified aims are substantially achieved by a system and a method for detecting users in a ski area comprising the technical features set forth in one or more of the appended claims. The dependent claims correspond to possible embodiments of the invention.

[0012] In particular, the specified technical task and the specified objects are substantially achieved by a detection system for detecting users for a ski area comprising at least one ski slope and at least one ski lift. The detection system comprises at least one detection device for detecting people, preferably by means of wireless signals, emitted by user interface devices (smartphone, smartwatch and any other smart device), arranged along the ski slope and configured to generate and send a detection signal representative of the passage of a user interface device near the detection device itself at a given moment or time interval and a control unit configured to communicate with the detection device to receive the detection signals so as to define a database representative of a number of users who have used the ski slope in given moments or time intervals. Alternatively, the detection of people is performed by means of a light beam sensor which detects the passage of people when the light beam is interrupted.

[0013] In particular, the specified technical task and the specified objects are further achieved by a ski area comprising at least one ski slope, at least one ski lift and a detection system as described above.

[0014] Furthermore, the specified technical task and the specified objects are substantially achieved by a method for detecting users in a ski area referred to above comprising the steps of detecting the passage of people by means of a detection device arranged along the ski slope, generating a detection signal representative of the passage of the user interface device near the detection device at a given moment or time interval, sending the detection signal to a control unit and defining by means of the control unit, and as a function of the people detected, a database representative of the number of users who have used the ski slope in given moments or time intervals.

[0015] Further features and advantages of the present invention will become more apparent from the indicative and thus non-limiting description of an embodiment of a system and a method for detecting users in a ski area.

Brief description of the figures

[0016] Such a description will be set out below with reference to the appended drawings, which are provided solely for illustrative and therefore non-limiting purposes, in which:

- Figure 1 is a schematic representation of a system object of the present invention;
- Figure 2 is a schematic representation of a ski area object of the present invention.

Detailed description of one or more preferred embodiments of the present invention

[0017] With reference to the appended figures, 1 denotes in its entirety a detection system for detecting users for a ski area 10. The ski area 10 comprises at least one ski slope 11 and, possibly, at least one ski lift 12. Preferably, the ski area 10 comprises a plurality of ski slopes 11 and a plurality of ski lifts 12. Alternatively, the lifts may not be present, for example, in the case of a cross-country slope.

[0018] The system 1 comprises at least one detection device 2 for detecting users U which can be any known solution, but preferably a detection device 2 for detecting wireless signals or a light beam detection device which detects the passage of the users U when the light beam is interrupted.

[0019] In the first case, the detection device 2 for detecting wireless signals, emitted by user interface devices, is arranged along the at least one ski slope.

[0020] A user interface device can be understood as a smartphone or other similar analog terminal device owned by or entrusted to a user "U" who is using the services of the ski area 10.

[0021] Preferably, the detection device 2 comprises a Bluetooth antenna.

[0022] In fact, Bluetooth communication is the interface standard of smartphones and smart devices (earphones, smart watches and the like). Bluetooth detection works without the installation of any dedicated APP. By virtue of the continuous and parallel scanning on Bluetooth frequency bands and on different Bluetooth protocols (BT 4.2 advertising, BT 2.1 inquiry) all the Bluetooth devices in the radio field of action of the Bluetooth antenna which have activated these protocol types are detected.

[0023] Alternatively or in addition, the detection device 2 comprises a WI-FI antenna.

[0024] The second standard which every smartphone supports is WI-FI. Every WI-FI connection is visible. Even without a connection, most smartphones periodically send a WI-FI signal. Also in this case, by virtue of the continuous and parallel scanning on the WI-FI frequency bands, all the devices with the WI-FI on in the field of action of the WI-FI antenna are detected.

[0025] Even more preferably, the detection device 2 comprises both a Bluetooth antenna and a WI-FI antenna so as to be able to ensure the detection of any user interface device in transit near the detection device 2 itself.

[0026] It should be noted that the field of action of the detection device 2 is sufficient for tracking the users in transit for the section of ski slope 11 where the detection device 2 is located.

[0027] The detection device 2 is configured to continuously scan said wireless signals in a predefined perimeter of the detection device 2 (range of action) and to generate and send to the control unit 3 at least one detection signal representative of the passage of a user interface device (or of the user "U" in possession of the user interface device) near the detection device itself in a given moment or time interval.

[0028] The term given moment (or time interval) means that the signal generated and sent by the detection device 2 keeps track as well as of the passage, of an indicative or precise time in which the passage of the user interface device occurred.

[0029] Preferably, the detection device 2 is made in the form of a small trellis or a pole.

[0030] Preferably, the detection device 2 is made in the form of a box-shaped body positionable on the edge of the slope or on a tree.

[0031] That is, the detection device 2 can be made in any form suitable for obtaining the best reading of the user interface devices or which impacts the landscape in which the ski area 10 is located as little as possible.

[0032] The detection device 2 can be advantageously mounted on a snow gun and use the connections of the snow gun to the central control unit of the snow guns to transmit the information related to the detection.

[0033] The system 1 further comprises a control unit 3 configured to communicate with the detection device 2 to receive the detection signals so as to define a database 4 representative of a number of users "U" who have used the ski slope 11 or a section thereof in given moments or time intervals. Advantageously, the database 4 can be viewed in real time or at any time by an operator who is therefore able to know which ski slopes 11 or sections of ski slope 11 have been used most.

[0034] That is, the control unit 3 has the function of processing the detection signals received from the detection device 2 in order to count the number of users "U". Furthermore, the possibility of associating a time to the passage of users allows to obtain information about the use of the ski slope 10 and therefore the need to intervene on the same slope due to continuous and massive use in order to adequately redistribute the snow on the slopes themselves.

[0035] Preferably, and as for example shown in figure 1, the system 1 comprises at least two detection devices 2 arranged along the ski slope 11, for example downstream and upstream of the ski slope.

[0036] In such a configuration, the control unit 3 is configured to cross-reference the detection signals sent by each detection device 2 with a number of users "U" who have used the ski lift 12 in given moments in time. Such a number of users "U" who have used the ski lift 12 can for example be obtained through the number of ski passes sold or other similar methods. Thereby, the control unit 3 is able to estimate a real number of users who have used the specific ski slope 11 and a possible residence time of the users "U" on the ski slope 11 so as to obtain

a respective database 4.

[0037] That is, an algorithm or software integrated in the control unit is configured to compare the detection signals of the detection devices 2 (or of the detection device in the case where only one is used) and to integrate them with the number of users who have used the ski lift 12 in order to apply corrective coefficients capable of estimating a real number of users who have used the specific ski slope 11.

[0038] Preferably, if there are three or four detection devices 2 along the ski slope 11, the cross-referencing of the respective detection signals with the number of users "U" who have used the ski lift 12 allows to precisely know the number of users "U" who have used the ski slope 11 in the different times and the time spent in the sections of the ski slope 11 between one detection device and the other 2 (or). Thereby, for example, if the ski lift 12 is provided with intermediate stations, it is possible to know when a user has left the ski lift and has entered the ski slope 11 and thus to know which sections of the ski slope 11 are the most crowded and thus more prone to need snowpack maintenance works.

[0039] The system 1 comprises a detection device 2 arranged in an entrance station 12a of the ski lift 12 and configured to generate and send a detection signal representative of the number of users "U" entering the ski lift and a detection device 2 arranged in an exit station 12b of the ski lift 12 and configured to generate and send a detection signal representative of the number of users "U" exiting the ski lift 12.

[0040] In such a configuration, the control unit 3, configured to receive the respective detection signals, is capable of estimating the aforesaid number of users "U" who have used the ski lift 12 at given moments in time. That is, without requiring methodologies such as counting ski passes sold, the system 1 is capable of knowing the number of users "U" who have used the ski lift 12 and the control unit 3 is capable of comparing such a number with the signals obtained from detection devices 2 in order to cross-reference them and obtain the real number of users "U" who have used the ski slope 11, in which sections and for how long.

[0041] For example, if the ski lift 12 is used for two sections of the ski slope 11 (as for example shown in figure 1), different counts (i.e., signals) will be obtained from the different detection devices 2. For example, a first detection device 2 arranged along a first section of the ski slope 11 detects one hundred users "U" between 2 in the afternoon and 3 in the afternoon and a second detection device 2, arranged along the second section of the ski slope 2, detects two hundred users in the same time interval (or moment in time). The detection devices 2 arranged along the ski lift count six hundred users "U" in the interval between two and three in the afternoon.

[0042] At this point, the control unit 3 (i.e., the software or algorithm integrated therein) estimates the real number of users "U" concluding that two hundred users have used the first section of the ski slope 11 and four hundred users have used the second section of the ski slope.

[0043] Preferably, the system 1 can comprise a detection device 2 near an intermediate station 12c of the ski lift 12. Thereby, the control unit 3 is capable of distinguishing the number of users "U" who have used the ski lift 12 in a first section and the number of users "U" who have used the ski lift 12 in a second section and capable of applying calculations similar to those described above in order to improve the estimate of the real number of users "U" who have used (or are using) the ski slope 11 and to make it more precise.

[0044] Preferably, the control unit 3 is configured to estimate a daily use of the ski slope 11 as a function of the number of users "U" who have used the ski slope 11 in the different time moments (or intervals) and to send a warning signal representative of the estimated daily use to an operator and/or to one or more machines for the emission of artificial snow (indicated singly with reference numeral 5 in figure 1). Thereby, the system 1 is capable of effectively and quickly identifying the portions of ski slope 11 which need further coatings of snow to return to an optimal condition with the snowpack uniformly distributed by means of, for example, snow guns (not shown).

[0045] Preferably, the control unit 3 is configured to send an alarm signal to an operator or automatic vehicle which is representative of the presence of one or more users "U" on the ski slope.

[0046] Thereby, it is also possible to have a better estimate of the number of users "U" and important statistical functions related to the use index of the ski slope 11 and the peak times in which it is used.

[0047] It should also be noted that the control unit 3 is configured to connect to third-party software/hardware systems so as to receive external data which can be considered for the estimation, calculation and statistics functions.

[0048] For example, such systems can be any equipment for detecting the flow of skiers based on: weather forecast data and/or day of the week (calendar) and/or comparisons with historical data of the flow of skiers on the same day/period of the previous year(s) and/or tickets sold and/or other relevant information.

[0049] The present invention further relates to a ski area 10 comprising at least one ski slope 11, at least one ski lift 12 and a system 1 as described above (according to one of the embodiments compatible with the needs of the owner of the ski lift and/or the environmental and weather conditions of the location where the ski area 10 is located).

[0050] The present invention further relates to a method for detecting users "U" in a ski area 10. The term method is intended to mean a computer program, software or algorithm (or part thereof), installed or installable in the system 1, the steps of which are performed by one or more of the components of the system 1 described above.

[0051] The method comprises the steps of detecting wireless signals emitted by a user interface device (smartphone) by means of a detection device 2 arranged along the ski slope 11, generating a detection signal representative of the passage of the user interface device (or of the user "U") near the detection device 2 at a given moment (or time interval) and sending the detection signal to a control unit 3.

[0052] The method further includes defining, by means of the control unit 3 and as a function of a plurality of detection signals, a database 4 representative of the number of users "U" who have used the ski slope 11 at given moments of time (or intervals).

[0053] Preferably, the method includes detecting wireless signals by means of a further detection device 2 arranged along the ski slope 11, generating a further detection signal representative of the passage of the user interface device near the further detection device 2 at a given moment or time interval and sending the further detection signal to the control unit 3. Preferably, the method further includes detecting a number of users "U" who have used the ski lift 12 in given moments or time intervals, cross-referencing the detection signals with the number of users "U" who have used the ski lift 12, and estimating a real number of users "U" who have used the ski slope 11 and a residence time of the users "U" on the ski slope 11, and obtaining a respective database 3 which can also be consulted in real time by an operator.

[0054] Preferably, the method includes estimating a daily use of the ski slope 11 as a function of the number of users who have used the ski slope in the different moments or time intervals and to send a warning signal as a function of the estimated daily use to an operator and/or to one or more machines for the emission of artificial snow (indicated overall with the reference numeral 5).

[0055] That is, the warning signal will be representative of the need to cover the ski slope 11 again and therefore, based on the use, it will be an alarm indicative of a low, medium or high severity of use and maintenance need of the ski slope 11.

[0056] Advantageously, the present invention is capable of overcoming the drawbacks which have emerged from the prior art.

[0057] Advantageously, the present invention allows to know precisely and non-invasively the number of users "U" who have used the ski slope 11 so as to use such data for statistical purposes or to plan the maintenance of the ski slopes 11, also knowing whether they are still crowded in order to avoid possible accidents.

Claims

1. A detection system (1) for detecting users (U) for a ski area (10) comprising at least one ski slope (11) and at least one ski lift (12), said detection system (1) comprising:

   - at least one detection device (2) for detecting the passage of users (U) arranged along said at least one ski slope (11) and configured to:
   - generate and send at least one detection signal representative of the passage of a user near the detection device (2) itself at a given moment or time interval;
   - a control unit (3) configured to communicate with said at least one detection device (2) to receive said detection signal and to count the number of passing users (U) so as to define a database (4) representative of a number of users who have passed at said at least one detection device (2) in such moments or time intervals:

   characterised in that said control unit (3) is configured to:

   - receive data related to the number of users (U) who have used the ski lift (12) in said moment or time interval;
   - cross-reference said data related to the number of users (U) who have used the ski lift (12) with the count of the number of users who have passed at said at least one detection device (2);
   - correct said count of the number of users who have passed at said at least one detection device (2) as a function of the received data related to the number of users (U) who have used the ski lift (12) so as to estimate a real number of users (U) who have used the ski slope (11) in said moments or time intervals.

2. The detection system (1) according to claim 1, **characterised in that** it comprises at least two detection devices (2) arranged along said at least one ski slope (11) spaced apart from each other and wherein said control unit (3) is configured to:

   - receive the respective detection signals from the two detection devices (2);
   - cross-reference the data contained in said respective detection signals sent by each detection device (2) so as to estimate an average number of users who have passed from the first detection device (2) to the second (2) in a certain time interval;
   - correct said estimate of the average number of users as a function of the received data related to the number of users (U) who have used the ski lift (12) so as to estimate said real number of users (U) who have used the ski slope (11) between said detection devices (2) in said time interval.

3. The detection system (1) according to claim 1 or 2, wherein said detection device (2) comprises a Blue-

tooth antenna and/or a WI-FI antenna and is configured to:

- detect wireless signals, emitted by user interface devices, preferably smartphones,
- continuously scan said wireless signals in a predefined perimeter of the detection device (2);

said control unit (3) being configured to communicate with said at least one detection device (2) to count the number of users (U) as a function of the number of wireless signals detected in said moment or time interval.

4. The detection system (1) according to claim 1 or 2, wherein said detection device (2) comprises a light beam sensor which detects the passage of users when the light beam is interrupted.

5. The detection system (1) according to one or more of the preceding claims, comprising a detection device (2) arranged in an entrance station (12a) of the ski lift (12) and configured to generate and send a detection signal representative of the number of users (U) entering the ski lift (12) and a detection device (2) arranged in an exit station (12b) of the ski lift (12) and configured to generate and send a detection signal representative of the number of users (U) exiting the ski lift (12), said control unit (3) being configured to receive said detection signals containing said data related to the number of users (U) who have used the ski lift (12) so as to estimate said number of users (U) who have used the ski lift (12) at given moments or time intervals.

6. The detection system (1) according to one or more of the preceding claims, wherein said control unit (3) is configured to estimate a daily use time of the ski slope (11) or sections thereof as a function of the number of users (U) who have used the ski slope (11) or sections thereof in the different moments or time intervals and to send a warning signal representative of the estimated daily use to an operator and/or to one or more machines for the emission of artificial snow (5).

7. The detection system (1) according to one or more of the preceding claims, wherein said control unit (3) is configured to send an alarm signal to an operator or automatic vehicle which is representative of the presence of one or more users on the ski slope (11).

8. The detection system (1) according to one or more of the preceding claims, wherein each detection device (2) is configured to estimate the number of users (U) who have used the same ski slope (11) and/or ski lift (12).

9. A ski area (10) comprising at least one ski slope (11), at least one ski lift (12) and a detection system (1) according to one or more of the preceding claims.

10. A method for detecting users in a ski area (10) according to the preceding claim, comprising the steps of:

- detecting the passage of users (U) by means of a detection device (2) arranged along said at least one ski slope (11);
- generating a detection signal representative of the passage of said user interface device near the detection device (2) at a given moment or time interval;
- sending said detection signal to a control unit (3);
- defining, by means of said control unit (3) and as a function of a plurality of detection signals, a database (4) representative of the number of users (U) who have used the ski slope (11) at given moments or time intervals; **characterized in that** it comprises the following further steps:

  - receiving data related to the number of users (U) who have used the ski lift (12) in said moment or time interval;
  - cross-referencing said data related to the number of users (U) who have used the ski lift (12) with the count of the number of users who have passed at said at least one detection device (2);
  - correcting said count of the number of users who have passed at said at least one detection device (2) as a function of the received data related to the number of users (U) who have used the ski lift (12) so as to estimate a real number of users (U) who have used the ski slope (11) in said moments or time intervals.

11. The method according to claim 10, comprising the steps of:

- detecting the passage of users (U) by means of a further detection device (2) arranged along said at least one ski slope (11);
- receiving the respective detection signals from the two detection devices (2);
- cross-referencing the data contained in said respective detection signals sent by each detection device (2) so as to estimate an average number of users who have passed from the first detection device (2) to the second (2) in a certain time interval;
- correcting said estimate of the average number of users as a function of the received data related to the number of users (U) who have used the

ski lift (12) so as to estimate said real number of users (U) who have used the ski slope (11) between said detection devices (2) in said time interval.

12. The method according to claims 10 or 11, wherein said step of detecting the passage of users (U) is performed by one or more detection devices (2) comprising a Bluetooth antenna and/or a WI-FI antenna, the method further comprises the following operating steps:

- detecting wireless signals, emitted by user interface devices, preferably smartphones,
- continuously scanning said wireless signals in a predefined perimeter of the detection device (2);

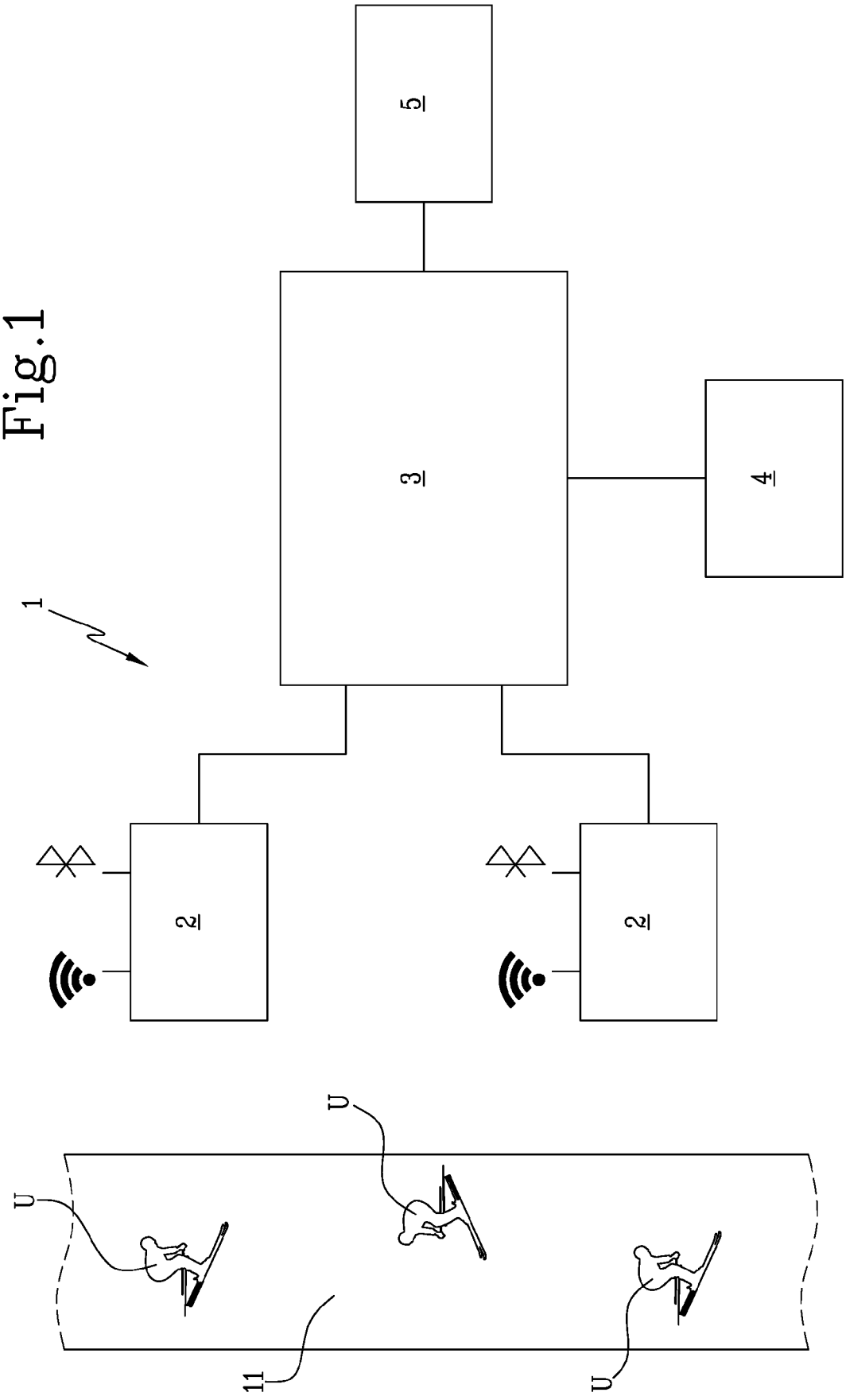
said control unit (3) being configured to communicate with said at least one detection device (2) to count the number of users (U) as a function of the number of wireless signals detected in said moment or time interval.

13. The detection system (1) according to claim 10 or 11, wherein said step of detecting the passage of users (U) is performed by means of one or more light beam sensors which detect the passage of users when the light beam is interrupted.

14. The method according to one or more of claims 10 to 13, comprising the steps of:

- estimating a daily time use of the ski slope (11) or sections thereof as a function of the number of users (U) who have used the ski slope (11) or sections thereof in the different moments or time intervals;
- sending a warning signal as a function of said estimated daily use to an operator and/or to one or more machines for the emission of artificial snow (5).

Fig.1



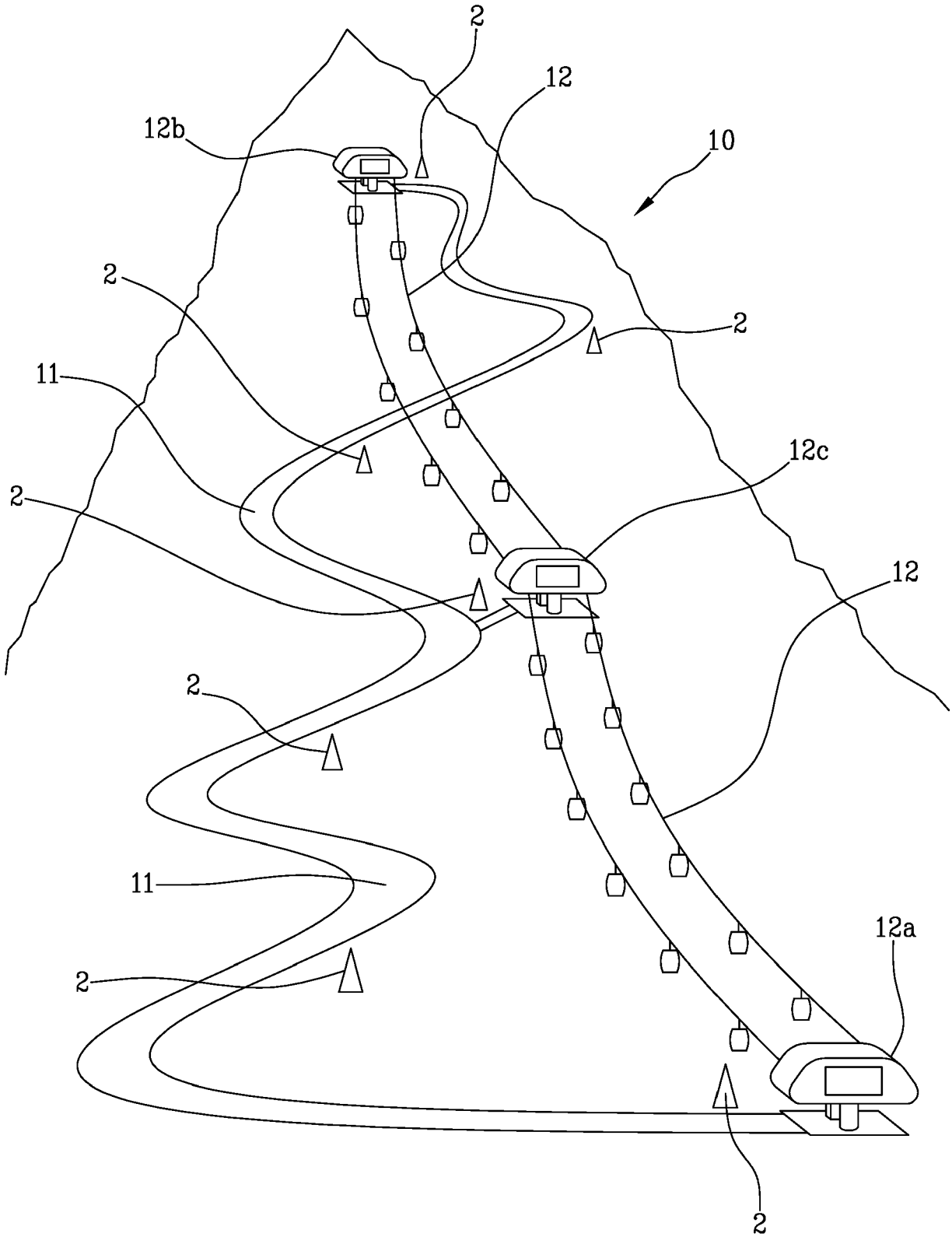


Fig.2

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EUROPEAN SEARCH REPORT

Application Number
EP 22 17 5323

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	FR 2 958 776 A1 (LUMIPLAN MONTAGNE [FR]) 14 October 2011 (2011-10-14) * claims 1-16 * * figures 1-5 * * page 2, line 13 - page 11, line 31 * -----	1-14	INV. G07C1/02 G07C11/00 G07C9/28 ADD. G06K7/10
X	JP 2011 229091 A (KDDI CORP) 10 November 2011 (2011-11-10) * figure 1 * * paragraph [0027] - paragraph [0028] * * paragraph [0069] - paragraph [0070] * -----	1,3-14	
X	FR 3 054 709 A1 (ROUX JEAN LUC [FR]; BERNARD TONY [FR]; MUNNIA-VINCENT SERGE [FR]) 2 February 2018 (2018-02-02) * claims 1-11 * * figure 1 * -----	1-14	
X	WO 2020/065606 A1 (DEMACLENKO IT S R L [IT]; HTI DIGITAL GMBH [AT]) 2 April 2020 (2020-04-02) * claims 1-22 * * figures 1-3, 6 * * page 31, line 13 - line 23 * -----	1-14	TECHNICAL FIELDS SEARCHED (IPC) G07C G06K

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	11 October 2022	Hniene, Badr

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 22 17 5323

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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11-10-2022

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