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(54) Title: PORTABLE REFEREE MONITOR

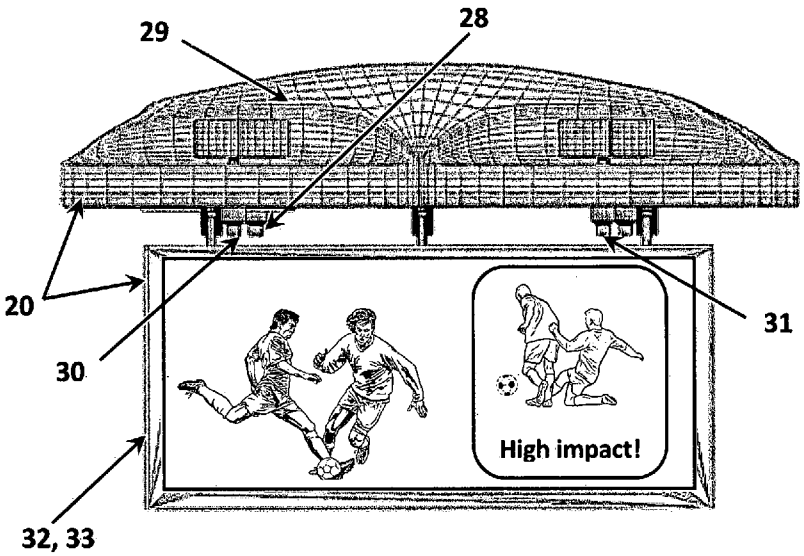

Fig. 3

(57) Abstract: To provide a robotic land or aerial moveable arrangement (20) carrying a monitor (21) for replaying videos of specific parts of the match to be reviewed (seen) by the yard main referee. A moveable land robot (22) or aerial robot (24) or UAV (29) approaches the referee by moving toward him on motorized wheels 23 or by flying, to show a video replay for the required part to assist him in giving the right decision. These video replays are collected from yard side stand cameras, UAV cameras and sensed impacts on a player leg or foot which are sensed via a net of piezoelectric material.

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— *without international search report and to be republished upon receipt of that report (Rule 48.2(g))*

PORTABLE REFEREE MONITOR

Description of the Invention

Technical Field of Invention

This invention relates to an unmanned robotic aerial or land vehicle provided with a monitor to assist the referee.

Background Art

After a soccer match end, a video replay can easily show how many mistakes the referee made. By replaying the critical moments in the match referees in studios can proof how a referee in a yard changed the direction of the whole match, blames will be put on the referees who may be accused to make these mistakes, but during the match a referee has no such assisting tools te review such accidents, wherein fights may occur in-between the player and the referee or in-between the two teams, it may extend to the audiance in the stands, to the roads, media...etc, but the fact is that unlike in the analytical studio, the referee does not have a video to replay the match during the match, and even recently there is an assistant referee replaying such videos and getting in contact with the referee, these does not work always, and is not decisive.

On Friday 10.11.2017 for the first time a TV screen installed on the side of the soccer yard will be provided to replay videos for the yard referee, this one is provided limitedly and specifically for England's friendly against Germany at Wembley, half century after one of the most controversial decisions in the history of the game at the 1966 World Cup final.

The international Football Association Board (IFAB) approved a two-year trial period of the video refereeing (VAR) system in 2016. It is being used in Italy and Germany this season but Friday's match will be the first time in an official game in Britain.

Video assistant referees watching the game on TV screens are available to review four types of situations – goals, penalty decisions, red cards and cases of mistakes identity. It is only to be used to coreect errors... But only the one who can initiate the review for the VAR (Video assitant refereeing) is the yard referee, who will have the final say wheather his original decision should stand

or be changed. They have the option to review footage themselves on a pitch-side monitor before making a final decision.

The side monitor will be provided with video replays collected from one of different stand cameras.

Another technique was used to record a play used during Aug.2017 where the referee on duty was strapped up with a portable head-cam, this cam was giving a real sense of the actual speed and intensity at which the proffesional game is played.

But in both cases: VAR and head portable-cam the main referee will not be able to watch directly what is recorded, in VAR situation, he needs to run to the side of the yard to approach the side monitor, while the portable-cam records may be viewed later.

Even the prior art is showing a reporter drone in int. Patent publication No.s: WO2014106814 (A Reporter Drone) and WO2014080388 (Police Drone) using screens for communication using a screen, but it is not showing any type of a moveable monitor approaching the referee once it is ordered to come to the referee to show a replay of the recorded video situation, instead the referee should run towards a screen (monitor) on the side of the yard, while there is no screen providing data collected from a drone camera tracking a referee eyes direction in addition to video data from yard side cameras with messages about the strength players hits against each others.

This need requires to provide the side monitor with the moveable techniques and embodiments to approach the referee in his place and to provide him with an instant video replay. This invention aim is to provide these invented requirements.

Disclosure of Invention

Brief Description

To provide a robotic land or aerial moveable apparatus provided with a monitor replaying specific parts of the match for yard main referee.

The robotic land apparatus is a robot provided with the monitor (TV screen) built-in in-between its neck and legs upper side, wherein this robot can approach the referee by moving on motorized wheels or legs, while in another embodiment, a robotic aerial apparatus carried over a flying body / board and having either a built-in rigid monitor (TV screen) or a foldable/ rotatable flexible display, such that when ordered by the yard referee, it flies (moves) toward him and show a video replay for the required part to assist him in giving the right decision.

Unlike the current side monitor, these video replays can be provided in addition to data messages and videos taken from other resources. Referee portable-cam video replays can be added to the show in another half screen or full screen to show the views from the referee eye angle not only from the yard side cameras.

The referee portable-cam can be replaced with a an arrangement consisting of a compass and tilt sensor, while a tracking sensor on a flying drone (UAV) can reposition the drone (UAV) or its camera to track the direction of the referee head front direction depending on signals from the compass and tilt sensor to record the captured videos, wherein once the main referee orders the monitor, it will not move toward him from the side of the yard, but as it is tracking him from nearby, it will show directly on its screen replayed videos captured from yard side cameras and from the drone's camera which is tracking the referee eye direction.

The screen can provide further data, such as the strength of hit which a player makes against the leg or foot of another player, wherein a net of nano-piezoelectric material covering the player foot top side in addition to his leg senses how much pressure occured to the leg or foot of a player when it is hit by another player, the referee can decide if that is extremely dangerous or if the player is acting.

Brief Description of the Drawings:

- FIG. 1: Illustrates a view for a wheel driven land robot provided with a built-in monitor.
- FIG. 2: Illustrates a view for an aerial robot provided with a built-in monitor.
- FIG. 3: Illustrates a view for an unmanned aerial vehicle (drone) carrying a monitor.
- FIG. 4 (A, B): Illustrates other views for the unmanned aerial vehicle (drone).
- FIG. 5: Illustrates a flow diagram for the input data- processing- output video on a screen.

Detailed description for carrying out the Invention:

Best Mode for Carrying out the Invention:

In order to make it easy to carry out the invention, a detailed description of the parts of the invention, supported with figures, is provided here, wherein the main parts are arranged sequentially, according to the importance of the part, it is made easy to read, by referring to each feature, with a number included in the parts description text, and in the parts numbering list, the numbering of parts features is indicated here, by starting it sequentially from number 20, whenever a part feature appears in a text, it will be directly assigned its required serial number. As example in FIG. 1, the parts' features are arranged sequentially from number 20, 21, 22...

To provide a robotic land or aerial moveable arrangement 20 comprising a monitor 21 for replaying videos of specific parts of the match to be reviewed (seen) by the yard main referee.

In a first embodiment, a land robot (machine / apparatus / tool / device) 22 is provided with a monitor (TV screen) 21 built-in in-between its neck lower side and legs upper side (Fig.1), wherein this land robot 22 can approach the referee

by moving on motorized wheels 23 or on legs, while in a second embodiment an aerial robot 24 is supported on a (flying body / board) 25, wherein the flying robot 24 is carrying a built-in rigid monitor (TV screen) 21 (Fig. 2)., such that when either the land robot 22 or the flying aerial robot 24 is ordered by the yard referee, it moves or fly toward him and shows a video replay for the required part to assist him in giving the right decision. The video replay is prepared by referee assistants inside a studio.

These video replays can be provided with further data and videos taken from other resources, unlike the current conventional side monitor. To show the views from the referee eye angle not only from the yard side cameras, conventional referee portable-cam 26 video replays can be added to the show of the land or aerial robots 22, 24 monitors 21 by appearing in another half of the monitor (screen) 21 side by side with the videos which are recorded via conventional stand cameras on the yard sides.

In a third embodiment the conventional referee portable-cam 26 can be replaced with a an arrangement consisting of a compass and tilt sensor 27 installed on the referee head front, while a tracking sensor 28 on a flying drone (UAV) 29 to reposition the drone (UAV) 29 or its forward camera 30 and backward camera 31 to track the direction of the referee eyes (sight) to record the captured videos in the same direction of his eyes, wherein the UAV 29 will replace the land or aerial robot, this UAV 29 is tracking the referee from nearby of around 5 meters range, such that when it is ordered for video replay, it will not move towards him from the side of the year, but it will approach him directly from nearby and show directly on its rigid monitor 32 or (foldable-rotatable flexible display) 33 replayed videos captured from yard side cameras and from the drone cameras 30, 31 which are tracking the referee eyes direction too (Fig. 4- A, B, C).

The monitors 32, 33 can display further data, such as the strength of hit which a player makes against the leg or foot of another player, wherin a net of nano-piezoelectric (piezo-electric) material 34 in a shape of a fabric covering the player foot top side in addition to his leg senses how much pressure (shock or impact) occured to the leg or foot of a player when it is hit by another player, these data with the cameras data are input to microprocessors 35 which

process them and show them on the monitors, wherein the referee can decide according to the output data on a display (monitor) 21 if that is extremely dangerous or if the player is acting, the data can be displayed in a message form: Strong impact, medium impact, low impact or no impact (Fig. 5) .

Note: It is obvious for the inventor that projectors can be used to project the video show on the monitor / display / screen or even under some conditions the projection can be done in the form of halogram.

Industrial applicability:

1- Robotic land or aerial moveable arrangement monitors, cameras, sensors, electronics, tools, and mechanisms are made from available tools, parts, mechanisms, with applicable modifications.
2- Multiple uses in monitoring different types of games and matches.
3- Conventionally remotely controlled, to use the command data from the command center (studio) to approach the referee, to assist him in taking or correcting his decision.

Parts Drawing Index:

20 Robotic land or aerial arrangement.

21 Monitor.

22 Land robot.

23 Motorized wheels.

24 Aerial robot.

25 Flying body / board.

26 Portable-cam.

27 Compass and tilt sensor.

28 Tracking sensor.

29 Drone (UAV).

30 Forward camera.

31 Backward camera.

32 Rigid monitor.

33 Foldable / rotatable flexible display.

34 Piezoelectric material.

35 Microprocessors.

Patent Application Cited documents:

Patent Application Publication No.	Publication date	Inventors:
WO2014106814	10.July, 2014	ALSHDAIFAT ..etal
WO2014080388	30.May, 2013	ALSHDAIFAT ..etal
WO2017178898	19.OCT.2017	ALSHDAIFAT, Wasfi

Claims

1- A robotic land or aerial moveable arrangement (20) comprising:
a monitor (21);
a land robot (22)
a motorized wheels (23);
a flying aerial robot (24);
a fly board (25);
a portable-cam (26);
a compass and tilt sensor system (27);
a tracking sensor (28);
a drone - UAV (29);
a Forward camera (30);
a backward camera (31);
a rigid monitor (32);
a foldable-rotatable flexible display (33);
a Net of piezoelectric material (34);
a microprocessor.

2- The robotic arrangement (20) in claim 1, wherein in a first embodiment the land robot (22) is provided with a monitor (TV screen) (21) built-in in-between its neck lower side and legs upper side such that the land robot (22) can approach the referee by moving on motorized wheels (23) or legs to display on the monitor (21) a requested video replay.

3- The robotic arrangement (20) in claim 1, wherein in a second embodiment the aerial robot (24) is supported on a (flying body / board) (25), such that the flying robot (24) is flying and carrying a built-in rigid monitor (TV screen) to approach the yard referee to display on the monitor (21) a requested video replay.

4- The robotic arrangement (20) in claim 1, wherein the portable-cam (26) is providing an additional video replays captured from the referee sight line by appearing in another half of the monitor (screen) 21 side by side with

the videos which are recorded via conventional stand cameras on the yard sides.

5- The robotic arrangement (20) in claim 1, wherein in a third embodiment the compass and tilt sensor (27) are installed on the referee head front tracking his eye sight line, while a tracking sensor (28) on a flying drone (UAV) (29) repositions the drone (UAV) 29 or its forward camera 30 and backward camera 31 to track the direction of the referee eyes (sight) to record the captured videos in the same direction of his eyes, wherein the UAV (29) is tracking the referee from nearby around 5 meters range, such that when UAV (29) is ordered for video replay, it approaches him directly from nearby and show directly on its rigid monitor (32) or foldable-rotatable flexible display (33) replayed videos captured from yard side cameras and from the drone cameras (30) (31) which are tracking the referee eyes direction too.

6- The robotic arrangement (20) in claim 1, wherein the net of piezoelectric material (34) senses the level of impact caused by a hit of a player foot against another player foot or leg, and communicate these data to a microprocessor (35) which display these data in message forms on the monitor (21).

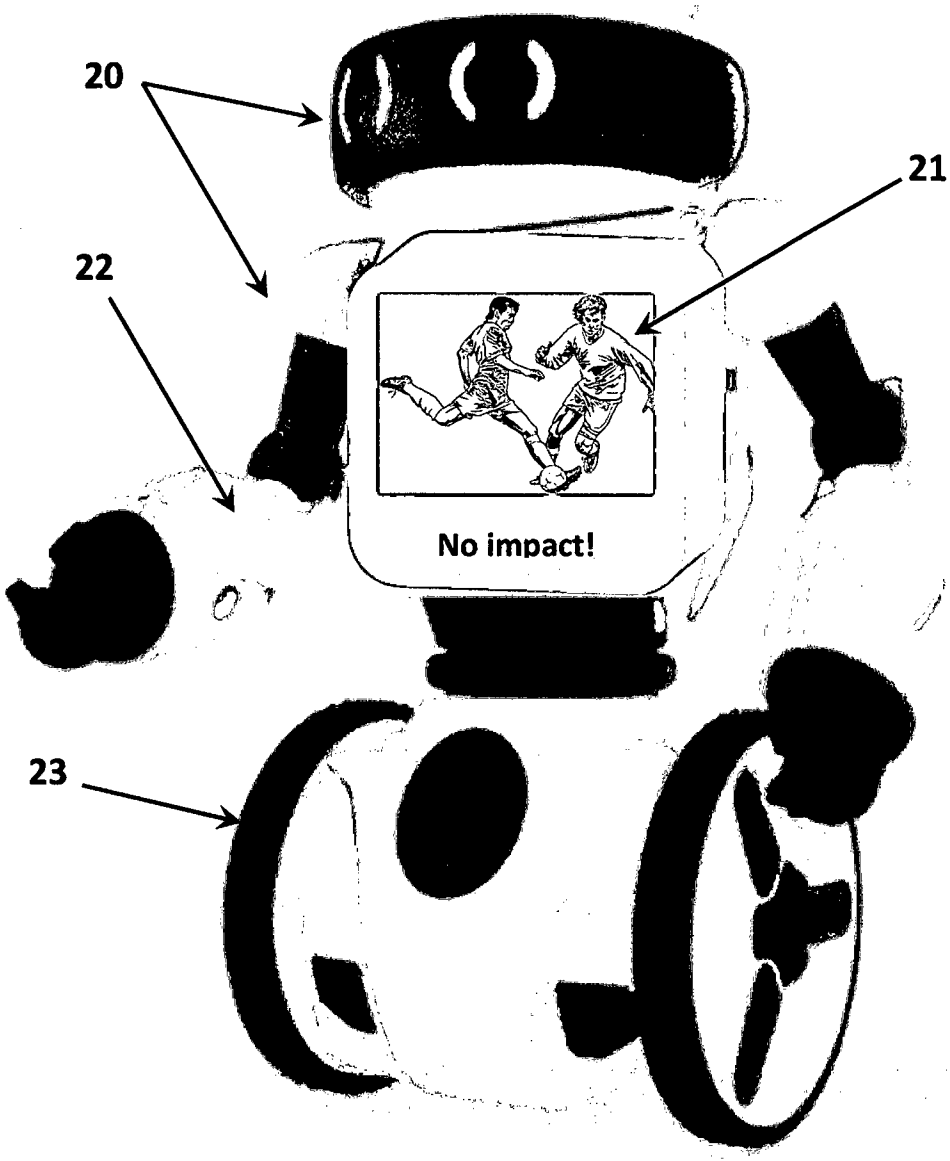

Fig. 1

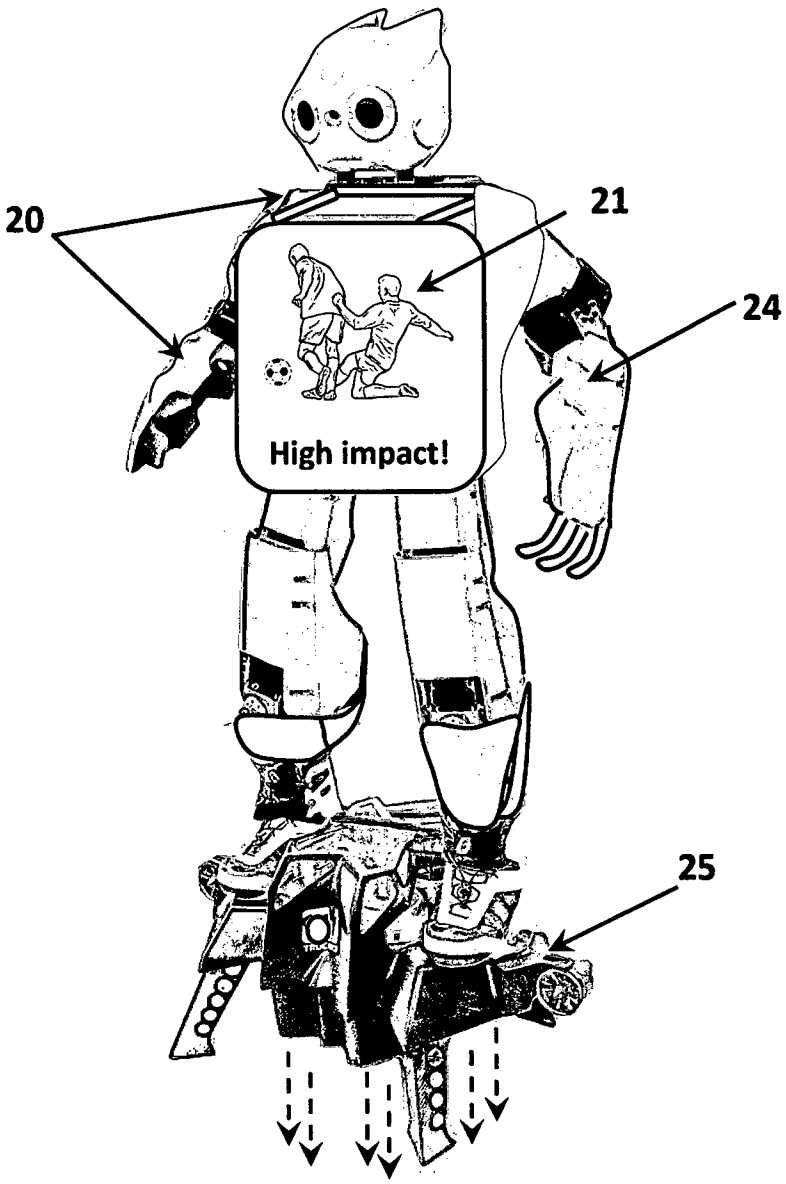

Fig. 2

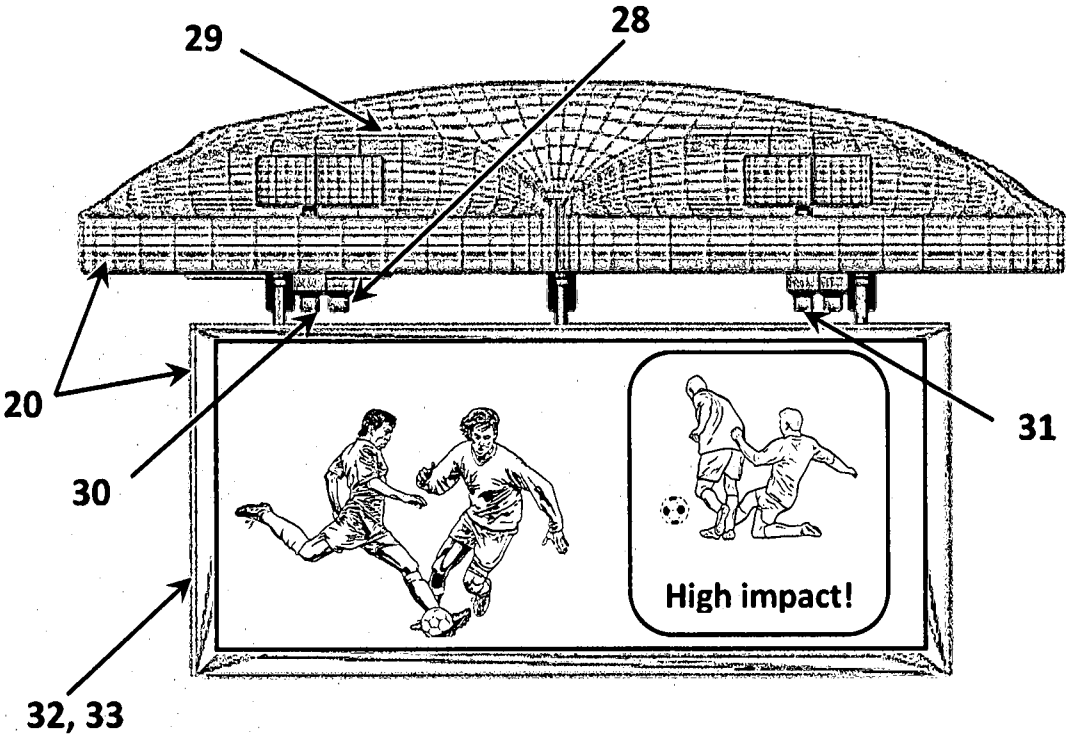

Fig. 3

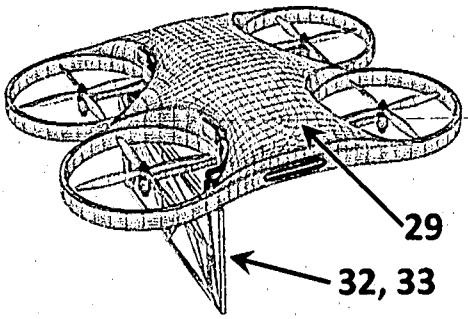

Fig. 4- A

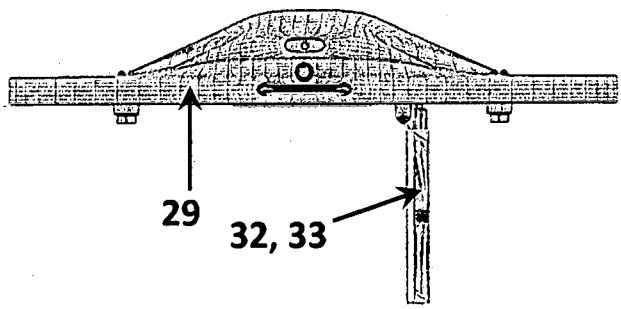

Fig. 4- B

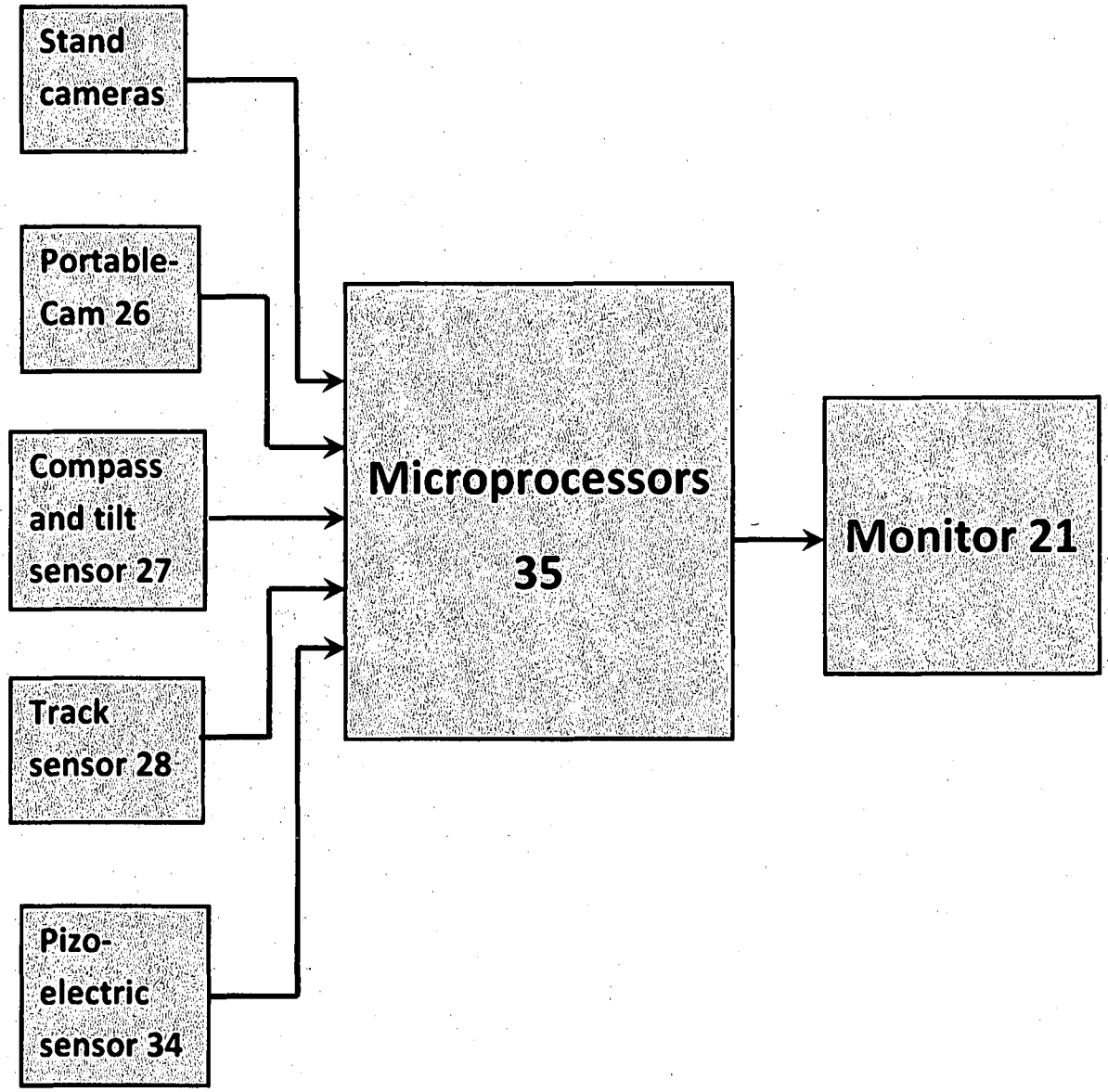
Stand cameras
Portable-Cam 26
Compass and tilt sensor 27
Track sensor 28
Pizo-electric sensor 34
Microprocessors 35
Monitor 21

Fig. 5