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UMPIRE AND SOLDIER INTERFACE

FIELD OF THE INVENTION

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The invention relates to a computer system with display and input means for the use by a person wearing a device which is a component of identification systems or simulation systems. The invention further relates to a communications system with at least one first computer system, which is used as personal interface for a first person and with a second computer system for a second person.

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BACKGROUND OF THE INVENTION

Identification/simulation systems are used in military or military-like employment. In the civilian area, such systems are mainly used for simulated games which come close to reality and make it possible for several participants to experience battle-like situations.

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The identification/simulation systems mentioned at the outset are used for differentiating between various participants in simulations, in battle or in simulated games. A typical laser-based identification/simulation system is described in European Patent Application No. 97 120818.6 (Publication No. EP 0 859 243 A1) of present Applicant. In such a laser identification/simulation system, the participants wear harness devices with sensors on their bodies and carry weapons with

a system device, which transmits a modulated laser beam. These harness systems are preferably those described in the following European Patent Applications: EP 0 859 243 A1, EP 0 836 068 A1 and EP 0 836 069 A1. The modulated laser beam transmits a message from the weapon of the marksman to the harness device of the sighted participant. This message requests the harness device of the sighted participant to identify itself, or respectively the wearer of the harness device. The sighted participant can return a confirmation code to the marksman for this purpose. Depending on the design, such a laser identification/simulation system makes possible the identification of friendly participants and the detection of enemy participants. This system can be used for the so-called identification friend or foe (IFF).

10 A laser-based combat simulation system is described in US Patent 5,788,500 of present Applicant. This system makes use of a special laser, which emits a continuous light beam. This type of laser is called continuous wave (CW) laser.

Battlefield activities have become more and more complex and develop with increasing speed. Decisions must be made in fractions of a second. Wrong decisions here could be fatal. Often little time remains to process the flood of information. This requires the full attention of the participant. Manipulation of map materials or other pieces of equipment, such as a compass, is only possible in exceptional cases.

It is also often necessary to make strategic decisions within the shortest time possible in order to react in this way to the actions of other participants. Such decisions must be immediately put into action and followed. This type of decisions customarily is made by a soldier of higher rank, who then passes on his decisions to his troops.

OBJECT AND SUMMARY OF THE INVENTION

25 It is the object of the invention to make available a novel computer system, in particular for use in military battle exercises or battles, or respectively in civilian simulation games. It is a further object of the invention to provide a communications system employing such novel computer systems.

In regard to the computer system, this object is attained by a computer system in accordance with claim 1, and in regard to the communications system by such a system in accordance with claim 16.

The invention will be described in greater detail in what follows by means of several exemplary embodiments in connection with the drawings.

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BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 shows a commercially available computer system,

5 **Fig. 2** shows the customary components of a commercially available computer system in accordance with **Fig. 1**,

Fig. 3 shows a computer system in accordance with the invention,

10 **Fig. 4** shows the components of a computer system of the invention and in accordance with **Fig. 3**,

Fig. 5 shows by way of example a harness device with a computer system in accordance with the invention, and

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Fig. 6 shows a communications system in accordance with the invention with a soldier interface and an umpire interface.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

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A computer system 1, such as can be used in connection with the present invention, is represented in **Fig. 1**. The internal structure of a commercially available computer system 1 is schematically represented in **Fig. 2**. It has a processor 10, a memory unit 11 (for example a RAM), a communications structure 12 (for example a computer bus) for exchanging information between
25 the elements of the computer system 1, and operational system software. Moreover, it requires an input unit 2 (for example a keyboard, a vocal input system or a touch-sensitive monitor), and a display (for example a computer monitor or goggles with an integrated display). The communications structure 12 has appropriate interfaces 13 so that this input unit 2 and the display 3 can be in contact with the elements of the computer system 1.

30 A commercial computer system, such as represented in **Figs. 1** and **2**, requires certain changes and additions in order to "rig" it for employment with an identification/simulation system. A computer system 20, which has been modified in accordance with the invention, is represented in **Fig. 3**. This computer system 20 is also called a soldier interface, since it represents an interface between the individual soldier and his surroundings. The internal structure of the computer system
35 20 is represented schematically in **Fig. 4**.

So that the computer system 20 can receive information from other participants, for example a superior, it has a receiving unit 25 in addition to the above mentioned elements. Only the antenna 24 of this receiving unit is visible in **Fig. 3**. The antenna can also be integrated into the housing or



attached to the harness device which the soldier wears on his body. The shape and layout of the antenna 24 is a function of the type of electromagnetic waves which must be received. This receiving unit 25 with the antenna 24 is laid out in such a way that it can be linked to the communications flow of an inter-soldier communications system. Such inter-soldier
5 communications systems have been sufficiently explained in the above mentioned patent applications.

As mentioned at the outset, the soldier wears a harness device, which is a component of an identification/simulation system, wherein the harness device contains a sensor unit for receiving first electromagnetic waves, a transmitting unit for transmitting electromagnetic waves, an intra-
10 soldier communications system and an evaluation unit. This intra-soldier communications system is used for the exchange of information between the sensor unit, the transmitting unit and the evaluation unit. If the sensor unit receives an electromagnetic wave (for example a lightwave) from the weapons of a marksman, this electromagnetic wave is converted into an electrical signal and is passed on to the evaluation unit via the intra-soldier communications system. The signal is
15 evaluated there. If it is a signal of a "friendly" soldier, the evaluation unit makes response information available, which is then transmitted to the marksman by the transmitting unit. In this way the soldier identifies himself to the marksman as a "friendly" soldier.

One of the participants (for example the company commander) can use a computer with special software for assigning a code for inter-soldier communications to the commanders of
20 various units. The unit commanders each have a computer system for this purpose (for example a code setter unit), which transmits the code to be used to the individual soldiers of a unit by means of intra- soldier communications. To this end, the unit commander can aim the code setter unit from a short distance to the harness devices of his soldiers, so that the required information is transmitted to their harness devices through an intra-soldier communications channel.

As represented in Fig. 4, the computer system 20 has a communications device 26 for
25 connecting the computer system 20 with the intra-soldier communications system. Depending on the type of the harness system and of the intra-soldier communications system, there are different embodiments of the communications device 26. If the intra-soldier communications system is a cable- based system, the communications device 26 can be connected by means of a plug
30 connection with the intra-soldier communications system. If the intra-soldier communications system is an ultrasound system, an ultrasound receiver is required as a component of the communications device 26. For communications with an infrared intra-soldier communications system, the communications device 26 requires an infrared receiver (for example with an infrared detector diode).

35 The intra-soldier communications can be handled partially or also completely via a so-called personal area network (PAN). A PAN operates by means of weak currents flowing through the body of a soldier. This permits communications between components which the soldier wears and/or holds in his hand.



Some of the identification/simulation systems presently used have two separate communications channels for intra-soldier communications. This is advantageous in case an interference with one of the communications paths occurs. In a further embodiment of the invention the communications device 26 has a first receiver unit and a second receiver unit for
5 communications with the intra- soldier communications system, wherein the second receiver unit can be used in case there is interference with the first receiver unit.

A computer system 20 furthermore needs a GPS unit 27 for determining the position of the soldier. The GPS unit 27 in turn is connected with a GPS antenna 28, which receives position information from a satellite or other system. This antenna 28 can also be integrated into the
10 housing of the computer system 20. It is also possible to combine the various antennas with each other. The GPS system 27 makes data available which make it possible for the processor to determine the absolute or relative position of the soldier.

A special software module (not represented in Fig. 4), which processes the incoming and outgoing information, is now required. It is important that the data relevant to the soldier are
15 processed for a clear and simple representation on the display 23. To do this it is necessary to remove superfluous or unsuitable information in order not to overwhelm the soldier with such information. It is possible to emphasize information of special importance optically, graphically and/or acoustically. Simple graphic elements (symbols, icons) should be employed in order to achieve a clear, easily grasped representation on the display.

20 In one embodiment of the invention the software module has predefinable rules, which are taken into consideration in the course of processing the graphics. The predefined rules make it possible to represent the information relevant to the soldier on the display. For example, a simple rule can require that the luminosity of the display be reduced in the darkness. A further rule can cause the computer system to be deactivated or destroyed in particular situations (for example if
25 the soldier is taken prisoner). No limit is set for the design of such rules. They make it possible to adapt the computer system to defined conditions, and they can also trigger reactions, or respectively actions.

It is also possible to transmit life signals of soldiers continuously or at defined periods of time in order to cancel or destroy the contents of the computer system when such signals are no longer
30 received, or to cause a special code to be transmitted which indicates that something is wrong. Some of the harness devices also contain information which should not fall into the hands of an enemy soldier. Here, too, is it possible to destroy or cancel this information when a life signal fails to appear, or the transmission of a special code can be arranged.

There is also the possibility of electronically interrogating the battle status of a soldier or the
35 condition of a participant or of the systems. In addition, maps and information regarding the enemy, or respectively information regarding other participants, can be transmitted. If the operations include reconnaissance aircraft, the participants can receive additional information regarding the surroundings. It is also possible to inquire as to the own position or that of other participants.



Since the position of the soldier can be determined at any time by using the GPS unit 27, it is possible at any time to retrieve the relevant map portion, or the one of interest, from the electronic map information. The software module employs a type of filter for this purpose, which determines the information regarding the surroundings and processes it for graphic representation on the display 23, if required.

In connection with one embodiment of the invention it is possible to determine the position and direction of view of the soldier by means of suitable sensors, which are attached to the computer system or are worn by the soldier. These sensors provide information which is used by the software module for providing an appropriate rotation of the map information on the display 23. In this way the soldier always has the map information in front of him with the correct orientation.

In accordance with the present invention the soldier can wear a harness device 40, such as is schematically represented in Fig. 5. This harness device 40 is a component of an identification/simulation system, wherein the harness device 40 contains at least one sensor unit 41 for receiving electromagnetic waves 45, a transmitting unit 42 for transmitting electromagnetic waves 45, an intra-soldier communications system 44 and an evaluation unit 43. The intra-soldier communications system 44 is a wireless system in the embodiment represented. This intra-soldier communications system 44 is used for an information exchange between the sensor unit 41, the transmitting unit 42 and the evaluation unit 43. When the sensor unit 41 receives an electromagnetic wave 45 from a weapon of a marksman, this electromagnetic wave 45 is converted into an electrical signal and is passed on via the intra-soldier communications system 44 to the evaluation unit 43. The signal is evaluated there. If it is the signal from a friendly soldier, the evaluation unit 43 makes response information available, which is then transmitted by the transmitting unit 42 to the marksman. By means of this the soldier identifies himself to the marksman as a "friendly" soldier.

The computer system 50 in accordance with the invention is taken along by the soldier. In the present example it is connected by means of a cable and a plug connection 54 with the harness device 40. The computer system 50 exchanges information with the harness device and/or its elements 41, 42, 43 via this cable. The computer system 50 has an antenna, which is connected with a receiving unit. The system 50 receives information from another computer system (for example an umpire interface) via this antenna 52 and a wireless communications channel 53. In the example shown in Fig. 5, the computer system 50 does not have its own display. Instead, the soldier wears goggles 60 with a display element installed therein. The goggles 60 have a receiver 61, which receives information via the intra-soldier channel 44, which is then displayed to the soldier in the goggles 60.

Personal digital assistants (PDAs), hand-held computers, laptop computers, notebook computers, etc. are particularly suited for use in accordance with the invention. Ruggedness and weight are of particular importance. It is therefore necessary to take special steps regarding the housing and the battery life when using it for military purposes.



It should be noted here that the term electromagnetic waves is synonymous for different types of waves. Optical waves (for example in the infrared range) are also included, for example.

The term soldier is used in the specification and in the claims in order to make a simpler, clearer representation possible. However, it should be taken into consideration here that the system in accordance with the invention can also be used by others (for example the police or other action forces). It is also suitable for simulation. In this case the computer system is worn and used by a participant. In this sense this is also a sort of a soldier participating in a battle-like simulation. The specification addresses an intra-soldier communications system. Such a communications system can also be used by other people. For this reason, in the claims this is referred to as a so-called intra-person communications system.

The computer system of the invention can receive the respectively latest information from another participant, or respectively from a central computer. For example, the respectively latest map information can be transmitted to the computer system. The synchronization of all computer systems participating in a battle/simulation is possible by means of this. In this way errors can be prevented to a large extent. An umpire interface is preferably employed for this. This is also a computer system, wherein it has elements which allow its use in the interaction with the soldier interface in accordance with the invention. Such systems are known from the identification, or respectively simulation systems mentioned at the outset.

The computer system can also process information coming from a camera. A participant can carry such a camera on his helmet, for example. In this way visual information can be transmitted from the computer system of the soldier to another soldier. It is also possible to include a system for detecting information regarding the surroundings (situation awareness system) in the computer system in accordance with the invention.

However, intervening changes must be made in the systems known so far in order to provide an effective information exchange between the umpire interface in accordance with the invention and the soldier interface in accordance with the invention to become possible. An important point is that the soldier interface is respectively only provided with the necessary information by the umpire interface. In a further embodiment, the soldier interface can transmit GPS position information to the umpire interface for this purpose. The latter can then select a small map section, based on the present position of the soldier, from the entire amount of map information and can transmit it to the soldier.

The umpire interface can also gather information regarding the state of the health of the soldier(s). This requires special sensors, which record the pulse, blood pressure and other information of the soldier. In a first step, this information can be processed for use by the soldier himself. To this end, the software module can have a further module, which evaluates this information and displays it. This information can also be transmitted to the umpire interface which, in turn, also collects such information from other soldiers and can make certain decisions on the basis of this information.



A soldier interface and the umpire interface can be combined into a communications system, wherein a first computer system 20 is used as the soldier interface for a first soldier 31, and a second computer system 30 is used by a second soldier 32 as an umpire interface, such as schematically represented in Fig. 6. As explained in the previous paragraphs, the first computer system 20 has a first software module, a receiving unit 24, 25 for receiving electromagnetic waves 33 and a communications device 26. This communications device 26 makes it possible to connect the first computer system 20 with a second computer system 30 via a wireless communications channel 33 (inter-soldier communications channel). The second computer system 30 has appropriate communications means (for example a combined transmitter/receiver unit with an antenna 34) for receiving and transmitting electromagnetic waves, and a special software module for processing electronic map information. The special software modules makes it possible for the second computer system 30 to determine specific information regarding the surroundings from the electronic map information. This is then transmitted to the first computer system 20 via the wireless communications channel 33.

In a further embodiment, the communications system can be improved in that the first computer system 20 is equipped with a GPS unit 27, 28, which is used to determine the position of the first soldier 31. The GPS unit 27 is integrated into the computer system 20 in such a way that it can make appropriate position information available to the first software module. Then the first software module transmits the position of the first soldier 31 via the wireless communications channel 33 to the second computer system 30. Taking into consideration the position of the first soldier 31, the second computer system 30 can now determine the appropriate information regarding the surroundings from the electronic map information. This information regarding the surroundings can then be transmitted to the first computer system 20.

By means of the system of the invention in its various embodiments, the soldier/user has all important information available at all times. Because of this, deployments become more efficient, easier to control and also safer. Another soldier/user, for example a soldier of higher rank, can directly intervene in the events and can effect their course quite directly.

**WHAT IS CLAIMED IS:**

1. A computer system (20) with a display (23) and input means (22) for use by a person wearing a device, which is a component of an identification system or simulation system, wherein the device contains a sensor unit for receiving first electromagnetic waves, a transmitting unit for transmitting electromagnetic waves, an intra-person communications system and an evaluation unit, which receives signals from the sensor unit via the intra-person communications system and transmits signals to the transmitting unit via the intra-person communications system, wherein the evaluation unit derives information from the first electromagnetic waves, evaluates it and makes response information available for transmission by the transmitting unit, characterized in that the computer system (20) has

- a software module,
- a receiving unit (24, 25) for receiving second electromagnetic waves,
- a GPS unit (27, 28) for determining the position of the person, and
- a communications device (26) for connecting the computer system with the intra-person communications system.

2. The computer system in accordance with claim 1, characterized in that the communications device (26) has a plug connection, so that a connection with the intra-person communications system can be made.

3. The computer system in accordance with claim 1, characterized in that the intra-person communications system has an ultrasound communications system which makes communications between the sensor unit, the transmitting unit and the evaluation unit possible, wherein the communications system (20) has an ultrasound receiver, so that the computer system can be linked to the intra-person communications system.

4. The computer system in accordance with claim 1, characterized in that the intra-person communications system has an infrared communications system which makes communications between the sensor unit, the transmitting unit and the evaluation unit possible, wherein the communications system (20) has an infrared receiver, so that the computer system can be linked to the intra-person communications system.

5. The computer system in accordance with claim 1, characterized in that the communications device (26) has a first receiving unit and a second receiving unit for communication with the intra-person communications system, wherein the second receiving unit can be employed, if the first receiving unit is interfered with.

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6. The computer system in accordance with claim 1, characterized in that the software module provides graphic processing of the information intended for the person, so that it can be clearly reproduced on the display (23).

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7. The computer system in accordance with claim 6, characterized in that the software module takes predefined rules into account in the course of graphic processing.

8. The computer system in accordance with claim 7, characterized in that the predefined rules make it possible to represent the information, which is relevant to the person, automatically and in accordance with the situation on the display (23).

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9. The computer system in accordance with claim 1, characterized in that the receiving unit (24, 25) for receiving second electromagnetic waves is laid out in such a way that the computer system can be linked with an intra-person communications system.

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10. The computer system in accordance with claim 1 and 9, characterized in that the second electromagnetic waves are transmitted by another person, preferably a soldier of higher rank, and make possible the transmission of information from the other person to the computer system (20).

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11. The computer system in accordance with claim 1, characterized in that the position of the person is evaluated by the computer system (20) for determining information regarding the surroundings from electronic map information, and to make this available to the software module.

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12. The computer system in accordance with claim 11, characterized in that the software module processes the information regarding the surroundings for graphic representation on the display (23).

13. The computer system in accordance with claim 1, characterized in that electronic map information can be transmitted to the computer system (20) by means of the second electromagnetic waves.

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14. The computer system in accordance with claim 1, characterized in that it contains information regarding the direction of view of the person, wherein this information can be used for turning map information represented on the display (23) in accordance with the direction of view.

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15. The computer system in accordance with claim 1, characterized in that the device is a harness device.

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16. A communications system with at least one computer system (20), which is used as personal interface for a first person (31), and with a second computer system (30) for a second person (32), wherein the first computer system (20) has

- 5 - a first software module,
 - a first receiving unit (24, 25) for receiving electromagnetic waves, and
 - a communications device (26) for connecting the first computer system (20) with the second computer system (30) via a wireless communications channel (33), wherein the second computer system (30) has
- 10 - a second software module for processing electronic map information, and
 - a transmitting unit (34) for transmitting electromagnetic waves, and wherein the second computer system (30) determines information regarding the surroundings from the map information, and transmits it via the wireless communications channel (33) to the first communications system (20).

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17. The communications system in accordance with claim 16, characterized in that the first computer system (20) has a GPS unit (27, 28) for determining the position of the first person (31), wherein the GPS unit (27, 28) makes appropriate position information available to the first software module in such a way that the first software module can transmit the position of the first person (31)
- 20 to the second computer system (30) via the wireless communications channel (33).

18. The communications system in accordance with claim 17, characterized in that the second software module in the second computer system (30), taking into consideration the position of the first person (31), determines the appropriate information regarding the surroundings from the
- 25 electronic map information.

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