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(54) Method, arrangement and simulation apparatus for practising firing

(57) Simulation of firing in a field exercise system comprising one or more monitor apparatus, at least one launching pad and at least one target. The launching pad and the targets are arranged to determine their location information and to send it to at least one apparatus in the system. Real images of the environment, transmitted by a camera apparatus connected to the launching pad, is shown to at least the user of the launching pad for observing and selecting the target. In a simulation apparatus of the system, synthetic environment image are created by means of the landscape information stored in a memory in the simulation apparatus and the location information on the launching pad and the target. The image to be shown to at least the user of the launching pad can be changed to a synthetic environment image when the user of the launching pad launches a simulated projectile. In the simulation apparatus, proceeding of the projectile to be simulated is computed, and in one or more monitor apparatus, proceeding of the projectile is shown as synthetic environment images.

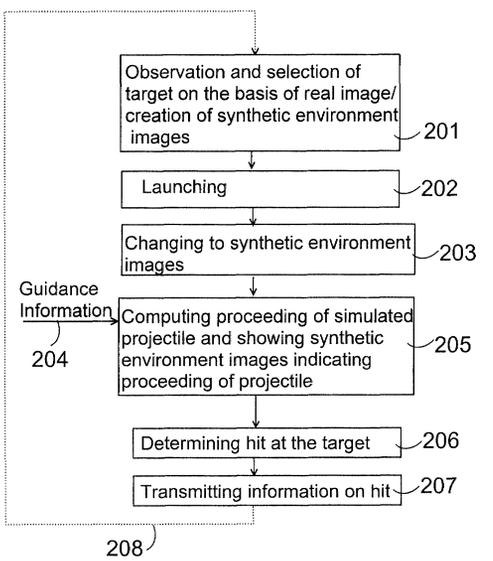

Fig. 2

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Description

BACKGROUND OF THE INVENTION

[0001] The invention relates to the practising of firing, more specifically to the simulation of firing a projectile in field conditions.

[0002] If possible, firing real projectiles is always avoided in military training. This is done both to save costs and to avoid dangerous situations. Firing can be practised with simulation created by a computer. The more realistic the simulation, the better the chance for soldiers to be trained for real battlefield situations. In practise, different simulation systems operating indoors are in use, but they do not create a great sense of reality. To improve the sense of reality, there is a need for what are called battlefield simulation systems that can be integrated in real military apparatus, such as different projectile systems, or in anti-air craft or artillery launching pads.

[0003] Present field simulation systems utilize laser which is installed on the projectile launching pad. Laser enables simulation of firing and identification of hitting the target. In these optically-guided systems, the targets are provided with reflectors, and the target is fired at with a laser beam. Since in a real situation, the projectile does not proceed in a straight line, as a beam of light does, the beam of light is deflected computationally. When the laser beam fired hits the target, the detectors positioned in the target detect the hit. Information on the hit can be transmitted to different parts of the system, such as to the firer and the trainer.

[0004] The problem with field simulation solutions according to the prior art is that no real-time information is received on what happens after the firing before the projectile hits the ground or the target. Thus, the proceeding of the projectile cannot be followed in real time, and the proceeding of the projectiles to be guided during the flight cannot be affected after the launching.

BRIEF DESCRIPTION OF THE INVENTION

[0005] An object of the invention is thus to provide a method and an apparatus implementing the method in such a way that the above problems can be avoided. The objects of the invention are achieved with a method, field exercise system and simulation apparatus characterized in what is stated in the independent claims. The preferred embodiments of the invention are disclosed in the dependent claims.

[0006] The invention is based on the idea that synthetic environment images are created in a field exercise system on the basis of the landscape information stored for the launching pad and the determined location information on the launching pad and at least one target, whereby the field exercise system functions as a field simulation system. Synthetic environment images indicating the proceeding of a simulated projectile are shown to at least the user of the launching pad. A synthetic environment image refers to an image created and updated by a computer, depicting a simulated environment and its objects, which are possibly moving.

[0007] An advantage of the solution according to the invention is that field exercises of realistic nature can be implemented by simulating the proceeding of a projectile in substantially real time in one or more monitor apparatus. The user of the launching pad can be trained in conditions with a great sense of reality by using a real image of the environment, transmitted by a camera apparatus in a desired manner, and by indicating proceeding of the projectile as a synthetic environment image, which can be made very realistic by means of the landscape and location information.

[0008] In accordance with a preferred embodiment of the invention, the image shown to at least the user of the launching pad is changed to a synthetic environment image when the user of the launching pad launches the simulated projectile. Thus, all measures taken prior to the launching, including observation and selection of the target, can be performed on the basis of the real image shown by the camera apparatus, only the proceeding of the projectile being shown as a synthetic environment image.

[0009] In accordance with a second preferred embodiment of the invention, the simulated projectile already launched is guided with guiding means in the launching pad. Guiding information on the guidance performed with the guiding means is sent to the simulation apparatus, and the simulation apparatus computes proceeding of the projectile to be simulated by taking the guiding information into account. This provides the advantage that the user of the launching pad can make corrective movements to the proceeding of the simulated projectile during the proceeding of the projectile.

[0010] In accordance with a third preferred embodiment of the invention, the degree of hitting the selected target is determined in the simulation apparatus. The information on the degree of hitting is sent to at least the target and the user of the launching pad. Explosion animation is shown to the user of the launching pad, and the explosion is simulated in the target in accordance with the degree of hitting, when required. This embodiment adds to the sense of reality in exercises.

[0011] In accordance with yet another preferred embodiment of the invention, the landscape information stored in the memory is digital map data and objects possibly added to the map data. In this way, the exercise area can be modelled to be highly realistic.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] The invention will now be described in more detail in connection with preferred embodiments, with reference to the attached drawings, of which:

[0013] Figure 1 shows a field simulation system according to a preferred embodiment of the invention;

[0014] Figure 2 shows simulation of firing according to a preferred embodiment of the invention; and

[0015] Figure 3 shows functions of apparatus according to a preferred embodiment of the invention.

DETAILED DESCRIPTION OF THE INVENTION

[0016] The invention can be applied to any firing simulation performed in field conditions.

[0017] Figure 1 shows a field exercise system according to a preferred embodiment of the invention, functioning as a field simulation system. The system comprises at least one launching pad LP and one or more targets TG1, TG2. The targets TG1, 2 can be immovable or moving targets on the ground, in the air or in water. The TG1, 2 and the LP comprise location determination means for determining location information, and data transmission means for setting up a preferably bidirectional data transmission connection to a simulation apparatus SA.

[0018] The SA is typically a separate computer apparatus for creating a synthetic environment image signal and transmitting it to the LP. The SA comprises data communications means TxRx for receiving information, particularly location information. The TxRx is preferably a transceiver, so that the SA can also send information to the targets TG1, 2 and/or to at least one launching pad LP. Correspondingly, the TG1, 2 and the LP comprise data transmission means for setting up a preferably bidirectional data transmission connection to the SA (not shown). The data transmission connections can be arranged with any data transmission means; at least between the targets TG1, 2 and the SA, preferably wireless communication is used. The connection between the LP and the SA can also be wireless, in which case better portability is achieved for the apparatus. For instance, code division, time division or frequency division techniques can be used in data transmission in the present field simulation system. The SA can also be fixed to the launching pad LP.

[0019] The SA also comprises external and/or internal memory MEM, in which landscape information can be stored. Further, the SA comprises an image generator IG, which can create highly realistic, preferably three-dimensional synthetic environment images, for instance on the basis of the landscape information. Preferably, the IG can compute and update the synthetic environment images at such a frame rate that the proceeding of the projectile can be shown as a video image creating a sense of reality. There is a reason to use a frame rate of more than 20 frames per second; however, > 30 frames per second is recommendable to achieve an image of high quality.

[0020] The launching pad LP can be an apparatus intended for firing at very different targets TG1, 2 (ground, maritime, air targets). Preferably, the LP is an apparatus firing projectiles to be guided after the launching. The LP can be a launching pad firing projectiles intended for ground targets or maritime defence projectiles, for instance. Since no real projectiles are fired in the present field simulation system, the LP does not have to be capable of firing live shots.

[0021] The launching pad LP comprises a camera apparatus CA mounted on it, the image produced by the CA enabling observation and selection of the target TG1, 2. The camera apparatus CA can be any analogue or digital apparatus transmitting images. In accordance with a preferred embodiment, the camera apparatus CA is a video camera. The CA can, however, be for instance a thermal camera based on infrared light or an optical observation apparatus, such as binoculars. The LP also comprises guiding means C, on the basis of which guiding information can be formed on the guiding measures taken by the user. The C can also be a game-controller-type apparatus. Also the launching information is read from the launching pad LP, typically on the basis of the position of the launching switch.

[0022] The system comprises one or more monitor apparatus MN, MN2 to 3. A monitor apparatus MN has been mounted on at least launching pad LP, by means of which MN the user can preferably watch the image from the camera apparatus CA, and on the other hand, the synthetic environment image transmitted by the simulation apparatus SA. The monitor apparatus MN and the camera apparatus CA can also be in the same apparatus, for example in an optical observation apparatus: ordinarily, the observation apparatus transmits real images, but when moving on to synthetic environment images, the synthetic environment image from the simulation apparatus SA is watched through an eyepiece. The system can also comprise other monitor apparatus MN2 to 3, which can be via a network NW, for example, available for the trainer, or a part of another apparatus in the system.

[0023] In the following, field simulation of firing according to a preferred embodiment of the invention is described by means of Figure 2. When the launching apparatus LP is taken to emplacement and made ready for firing, the observation and the selection of the target are performed, preferably on the basis of a real image 201. This provides the advantage that all measures prior to the launching can be implemented as realistically as possible. Simultaneously, synthetic environment images can be created 201 on the basis of the landscape information, the location information on the targets TG1, 2 and the location information on the launching pad LP. If the system comprises several launching pads LP, synthetic environment images are created separately for each launching pad LP on the basis of the location information on the LP.

[0024] When the launching is performed 202, the system changes over 203 to the synthetic environment image in accordance with a preferred embodiment. After this, the proceeding of the projectile is computed 205, and preferably, guiding information 204 on the guiding measures taken by the firer is taken into account. Pref-

erably, the user of the launching pad LP and his/her trainer are shown 205 synthetic environment images of the proceeding of the simulated projectile. In this way, both the trainee and the trainer can follow the simulated projectile proceed like a real projectile and even affect the proceeding of the projectile. Synthetic environment images can also be shown in a field simulation system as early as before the launching, but in such a case, an exercise will not be equally realistic.

[0025] When the simulated projectile hits the ground or the target, the hitting point and the information on the projectile hitting its target are determined 206. The information on the hit is sent 207 to the relevant parts of the system. After this, explosion animation can be shown. This provides the advantage that in the field simulation, hitting can be simulated immediately after the hit and a sense of reality can be achieved. After the simulated firing, one can go over 208 to the initial state, where one changes over to the real image. After this, the firing point can be changed, if required, the target can be selected again on the basis of the real image and the firing can be simulated again.

[0026] Figure 3 shows in greater detail functions of a launching pad LP, a simulation apparatus SA and a target TG1, TG2 according to the invention and information transmitted between them. The launching pad LP is taken to emplacement and made ready for firing 301. The LP preferably resembles a launching pad capable of live-shot-firing in all aspects (dimensions, weight, control apparatus etc.), whereby as realistic an exercise as possible is achieved, including all preparation measures for the firing. The inventive functionality can also be added to a launching pad that is fully capable of firing live shots.

[0027] The location and the direction of view of the launching pad are determined 302. The user of the LP can perform 303 the observation by means of a video image connected to the launching pad, received from the video camera CA and shown in the monitor apparatus MN, in other words on the basis of a real landscape image. The user selects 304 the target TG1, 2 on the basis of the real image. The location information and the direction of view determined are sent 305 to the simulation apparatus SA. Also, in one or more targets TG1, 2, the location information is determined 306, or has been determined as early as before the start of exercise. The location information on the targets TG1, TG2 is also sent 307, 308 to the simulation apparatus SA. The location information can be determined by means of any location determination method. For example, satellite positioning, such as the GPS or differential GPS (Global Positioning System) positioning, or radio location, can be used.

[0028] In accordance with an embodiment, it is also possible to transmit video images of the video camera CA when it is used (steps 301 to 304) to the monitor apparatus MN2 to 3 and/or to the simulation apparatus SA (not shown in Figure 3). Thus, for example the trainer can watch the same image as the user of the launching pad LP and follow the selection and observation by means of a real image. The data communications connection between the trainer and the launching pad LP can be bidirectional, in which case the trainer can give feedback and instructions immediately via a speech connection.

[0029] The SA, more precisely the IG, creates 310 synthetic environment images on the basis of the location information and the direction of view 305 of the launching pad LP, the location information 307, 308 on the targets and the landscape information 309. The landscape information 309 is preferably stored in a memory of the simulation apparatus SA, but they can also be positioned in a separate memory means, such as a CD-ROM disk. The landscape information 309 preferably comprises digital map data and different fixed objects possibly added to the map data, such as constructions not indicated in the map data, etc. The use of map data provides the significant advantage that the exercise area can be modelled highly realistically.

[0030] The image generator IG in the SA can create synthetic environment images on the basis of the map data stored in the memory, on one hand, and on the basis of the location information and the direction of view of moving objects (LP TG1, 2), on the other hand. A three-dimensional synthetic environment landscape accurately simulating the real landscape can be created with 3D modelling on the basis of the map data and different models of trees, buildings and roads, for example. Not only the map data but also the models required for the creation of a three-dimensional image are preferably stored in the memory MEM. There are also different models of moving objects, for instance a three-dimensional model of a combat vehicle, which can be shown as the target TG1 in a synthetic environment image. In a synthetic environment image, moving objects (LP, TG1, 2) are added to the landscape on the basis of the location information. Synthetic environment images are created on the basis of the information on the direction of view preferably from the launching pad seen from the direction of the tube/barrel.

[0031] In this way, the landscape and different fixed and moving objects relating thereto can be simulated highly realistically from different viewing locations and directions. The creation 310 of synthetic environment images can be started preferably when the LP has been taken to emplacement and location information is received 305 from it. There can also be an information monitor for showing a variety of information relating to the exercise. The information monitor can show the information on the distance to the target, for instance.

[0032] When the user of the launching pad LP launches 311 the simulated projectile, launching information 312 is sent to the simulation apparatus SA. Preferably, the switch SW of the SA switches 313 synthetic environment images to be transmitted to at least the launching pad 315. The change of the image can be preferably

implemented in such a way that the image shown in the monitor apparatus MN changes to a synthetic environment image as soon as synthetic environment images are received 315 from the SA. The simulation apparatus SA, more precisely the IG, computes 314 proceeding of the projectile, i.e. models the proceeding of the projectile in field conditions. The computing can take into account different parameters affecting the proceeding of the projectile, for instance weather conditions, for the launching pad LP, or parameters characteristic of a simulated projectile. The parameters can, for example, be set before the implementation of the exercise in accordance with the conditions at that moment. In accordance with the computed projectile proceeding information, synthetic environment images indicating the proceeding of the projectile are created, and thus the proceeding of the projectile is shown in a three-dimensional landscape. Image information is sent 315 at least to the launching pad LP to be shown in the monitor apparatus MN, and preferably also to the trainer's monitor apparatus MN2 to 3. Synthetic environment images indicating the proceeding of the simulated projectile are shown 316 in the monitor apparatus MN.

[0033] It is to be noted that the creation (310, 314) of synthetic environment images can be started only after the launching information has been received from the launching pad 312. Thus, however, a delay is caused in the creation of the image, so that it is recommendable to create synthetic environment images as early as before the launching.

[0034] The proceeding of the simulated projectile can be shown in several different ways: in accordance with a preferred embodiment, the proceeding of the simulated projectile is shown as seen from the end of the simulated projectile in the direction of proceeding of the projectile. The proceeding of the projectile can also be shown for instance from behind or from one side, or seen from the launching pad LP.

[0035] In accordance with a preferred embodiment of the invention, the LP comprises guiding means C, by means of which the user can affect the proceeding of the simulated projectile already launched and, in this way, guide 317 the projectile. Projectiles to be guided during the flight include several projectile types and aerial bombs. If the user wishes to change the proceeding of the projectile on the basis of the synthetic environment image shown in the monitor apparatus MN, the guiding information on the guidance by the user is sent 318 to the simulation apparatus SA. The guiding information is taken into account in the computation of the projectile proceeding and in the creation 314 of the synthetic environment image. It is also to be noted that the targets TG1, TG2 can move, in which case also their location information can change. The location information 307, 308 of the targets TG1, 2 and also the direction of view 305 of the launching pad LP can be continuously sent to the simulation apparatus SA, in which the IG takes the possible changes into account in the creation 314 of the synthetic environment image.

[0036] The SA (IG) observes 319 whether the simulated projectile has hit the ground or the target. If the projectile is still in the air, i.e. the hit has not taken place, the SA continues the projectile proceeding computation 314 and the sending 315 of the image information. When the hit takes place, the SA determines 320 the hitting point and the degree of hitting the target. This is carried out by comparing the computed end point of the simulated projectile with the location information 307, 308 received from the target TG1, 2. There can be several degrees of hitting, for example:

- no hit at the target (TG1/TG2)
- total destruction of the target
- partial destruction of the target:
    - destruction of part x (incapable of moving)
    - destruction of part y (incapable of firing).

[0037] The simulation apparatus SA sends 321 and 322 the hitting information (the degree of hitting and possibly other information) preferably to at least the launching pad LP and the selected target TG1, TG2. The information on the hit can also be transmitted to all parts of the field simulation system, such as the launching pads, the trainers and the targets. In the launching pad LP, explosion animation can be 323 shown as a synthetic environment image in accordance with the degree of hitting. An explosion can also be simulated in the target TG1, TG2 on the basis of the hitting information 322. Different sound and smoke effects, for example, can be used.

[0038] In accordance with a preferred embodiment of the invention, the above-described simulated firing can be stored in the memory MEM of the simulation apparatus SA or in another memory. Also the real image before the launching, for instance a video signal, can preferably be stored. Thus, the firing can be repeated and gone through again according to the need for training.

[0039] If the system comprises several launching pads LP, from which the projectiles to be fired are simulated, the different apparatus can be networked to each other for example via the network NW shown in Figure 1. The implementation of the simulation for several launching pads LP can be centralized in one simulation apparatus SA or decentralized in several separate ones. If several simulation apparatus SA are used, the different SAs can be networked through the network NW and at least the hitting information (321) can be transmitted to everyone who is participating in the exercise. The NW can be a wireless or wired network, which is based on the IP (Internet Protocol), for instance. This enables simulation of firing exercises for systems that can be located very far from each other physically.

[0040] The simulation apparatus SA can comprise one or more processors, in which above-described inventive functions (creation of synthetic environment im-

ages, computation of projectile proceeding and determination of the hit) are performed preferably by software, and the operation (e.g. switch SW, data communications means TxRx) of other means in the simulation apparatus SA are controlled. In the simulation apparatus SA, also hardware solutions can be used for the implementation of the functions. The system can even comprise a large number of launching pads LP for which synthetic environment images are created, and substantially simultaneously, the proceeding of the projectile is computed. This requires a large amount of computation capacity, so that the computation of the simulation apparatus SA can be decentralized in several different apparatus.

[0041] It is obvious to a person skilled in the art that with the advance of technology, the basic idea of the invention can be implemented in a plurality of ways. The invention and the embodiments thereof are not confined to the above-described examples but can vary within the scope of the claims.

Claims

1. A method of simulating firing in a computer-based field exercise system, comprising one or more monitor apparatus, at least one launching pad and at least one target, which method comprises the steps of:

   showing real images of the environment, transmitted by a camera apparatus connected to the launching pad, at least to the user of the launching pad;
   showing proceeding of a projectile to be simulated in one or more monitor apparatus, **characterized by** the method further comprising the steps of
   determining the location information in at least one launching pad and target;
   sending the location information to at least the simulation apparatus in the system;
   creating synthetic environment images in a simulation apparatus in a computer-based manner by means of the landscape information stored in a memory in the simulation apparatus and the location information on the launching pad and the target; and
   computing in the simulation apparatus proceeding of the projectile to be simulated, on the basis of which the proceeding of the projectile is shown in a synthetic environment image to be updated in a computer-based manner.

2. A method according to claim **1, characterized by**

   real images of the environment, transmitted by the camera apparatus connected to the launching pad, being shown at least to the user of the launching pad during the observation and selection of the target; and
   changing the image shown to the user of the launching pad to a synthetic environment image as a response to the user of the launching pad launching the simulated projectile.

3. A method according to claim 1 or 2, **characterized by**

   guiding the simulated projectile already launched with guiding means in the launching pad;
   sending the guiding information on the guidance performed with the guiding means to the simulation apparatus; and
   computing proceeding of the projectile to be simulated by taking the guiding information into account.

4. A method according to claim 3, **characterized by**

   sending also the direction of view from the launching pad to the simulation apparatus; and creating synthetic environment images in the simulation apparatus in accordance with the direction of view.

5. A method according to any one of the preceding claims, **characterized by**

   showing synthetic environment images of the proceeding of the simulated projectile in one or more monitor apparatus, seen from the end of the projectile in the direction of proceeding thereof.

6. A method according to any one of the preceding claims, **characterized by**

   determining in the simulation apparatus the degree of hitting at the target;
   sending the information on the degree of hitting at least to the target and the user of the launching pad; and
   showing explosion animation to the user of the launching pad and simulating, when required, explosion at the target in accordance with the degree of hitting.

7. A method according to any one of the preceding claims, **characterized by**

   sending the launching information from the launching pad to the simulation apparatus; and changing in one or more monitor apparatus the image shown to a synthetic environment image

by means of a switch in the simulation apparatus as a response to the reception of the launching information from the launching pad.

8. A method according to any one of the preceding claims, **characterized by**

practising by the method the use of the launching pad firing projectiles to be guided after the launching.

9. A method according to any one of the preceding claims, **characterized by**

the camera apparatus being a video camera, a thermal camera or an optical observation apparatus.

10. A method according to any one of the preceding claims, **characterized by**

the landscape information stored in the memory being digital map data and objects possibly added to the map data.

11. A method according to any one of the preceding claims, **characterized by**

determining the location information with the GPS technique or radio location technique.

12. A computer-based field exercise system for simulating firing, which system comprises one or more monitor means, at least one launching pad, at least one target, a camera apparatus to be connected to the launching pad for transmitting a real image of the environment and for indicating the proceeding of the projectile to be simulated in the simulation apparatus in at least one monitor apparatus, **characterized in that**

at least one launching pad and target are arranged to determine their location information and to send it to the simulation apparatus;
the simulation apparatus comprises memory for storing landscape information;
the simulation apparatus is arranged to create synthetic environment images in a computer-based manner by means of the landscape information stored in the memory and the location information on the launching pad and the target; and
the simulation apparatus is arranged to compute proceeding of the projectile to be simulated and to transmit synthetic environment images to be updated in a computer-based manner on the basis of the computed proceeding of the projectile to be shown in one or more monitor apparatus.

13. A field exercise system according to claim 12, **characterized in that**

the simulation apparatus is arranged to change the image shown to at least the user of the launching pad to a synthetic environment image as a response to the user of the launching pad launching the simulated projectile.

14. A field exercise system according to claim 12 or 13, **characterized in that**

the launching pad comprises guiding means for guiding the simulated projectile already launched;
the launching pad is arranged to send the guiding information on the guidance performed with the guiding means to the simulation apparatus; and
the simulation apparatus is arranged to compute proceeding of the projectile to be simulated by taking the guiding information into account.

15. A field exercise system according to any one of claims 12 to 14, **characterized in that**

the simulation apparatus is arranged to determine the degree of hitting the selected target;
the simulation apparatus is arranged to send the information on the degree of hitting to at least the target and the user of the launching pad; and
the simulation apparatus is arranged to show explosion animation to the user of the launching pad in accordance with the degree of hitting, and at least one target is arranged, when required, to simulate explosion in accordance with the degree of hitting.

16. A computer-based simulation apparatus of a field exercise system, comprising means for showing the proceeding of the projectile to be simulated in one or more monitor apparatus, **characterized in that**

the simulation apparatus comprises data communications means (TxRx) for receiving location information from at least one launching pad and from at least one target;
the simulation apparatus comprises memory (MEM) for storing landscape information;
the simulation apparatus comprises an image generator (IG) for creating synthetic environment images in a computer-based manner by means of the landscape information stored in the memory (MEM) and the location informa-

tion on the launching pad and the target; and the image generator (IG) is arranged to compute proceeding of the projectile to the simulated, and the simulation apparatus is arranged to transmit synthetic environment images to be updated in a computer-based manner on the basis of the computed proceeding of the projectile to be shown in one or more monitor apparatus.

17. A simulation apparatus according to claim 16, **characterized in that**

the simulation apparatus comprises a switch (SW) for changing the image to be shown to at least the user of the launching pad as a response to the reception of the information on the launching of the simulated projectile from the launching pad.

18. A simulation apparatus according to claim 16 or 17, **characterized in that**

the image generator is arranged to compute proceeding of the projectile to be simulated by taking into account also guiding information on the guidance by the user, received from at least one launching pad.

19. A simulation apparatus according to claim 16, 17 or 18, **characterized in that**

the image generator is arranged to determine the degree, of hitting the selected target; and the simulation apparatus is arranged to send information on the degree of hitting to at least the target and the user of the launching pad and to shown explosion animation to the user of the launching pad in accordance with the degree of hitting.

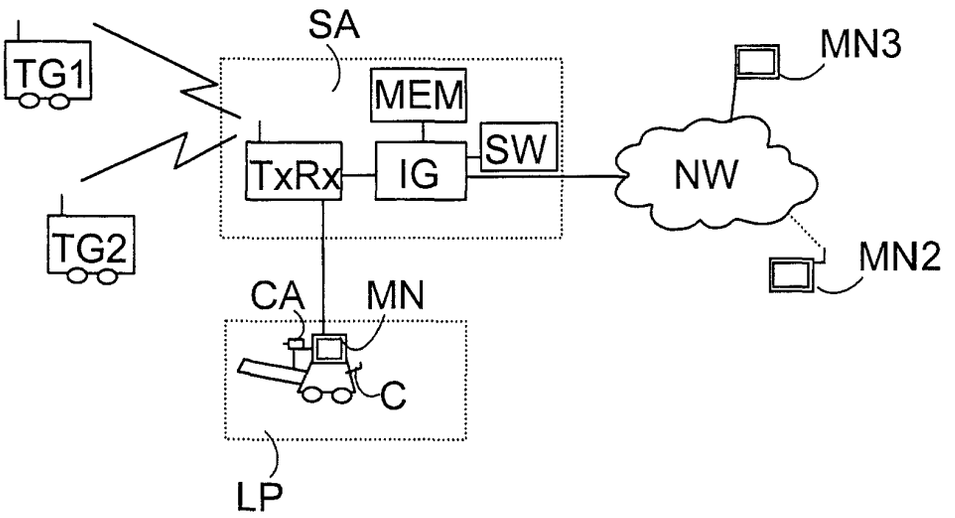
SA
TG1
MEM
SW
TxRx
IG
NW
MN3
TG2
MN2
CA
MN
C
LP

Fig. 1

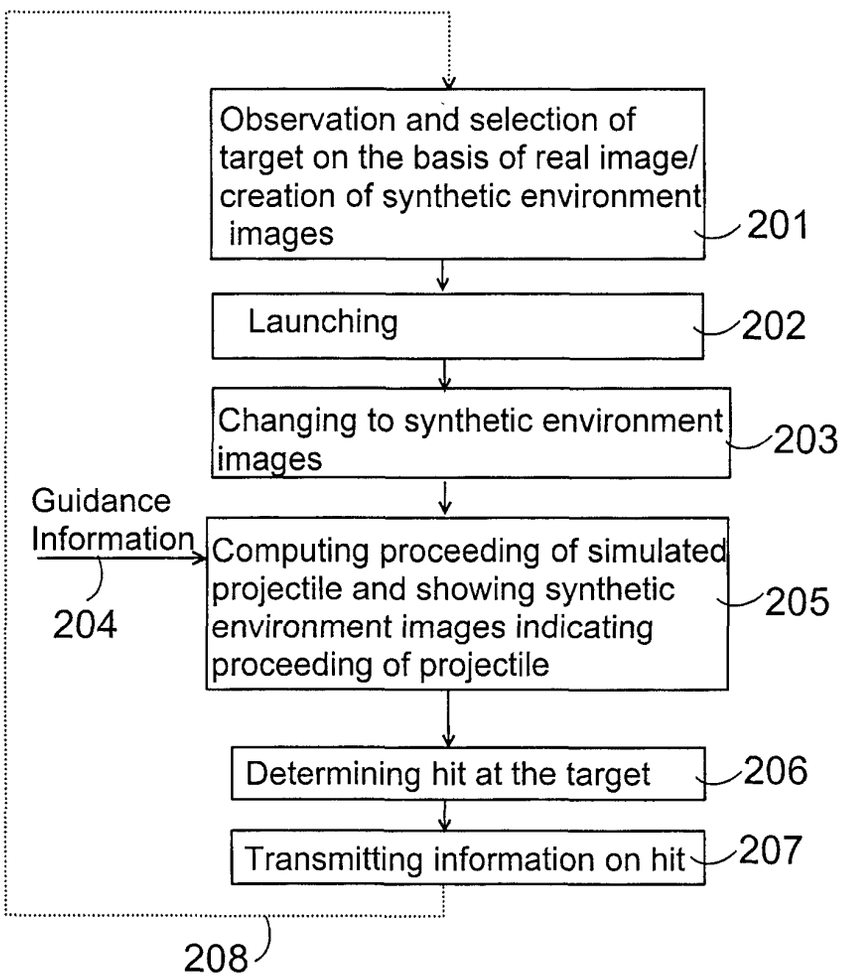
Observation and selection of target on the basis of real image/ creation of synthetic environment images
201
Launching
202
Changing to synthetic environment images
203
Guidance Information
204
Computing proceeding of simulated projectile and showing synthetic environment images indicating proceeding of projectile
205
Determining hit at the target
206
Transmitting information on hit
207
208

Fig. 2

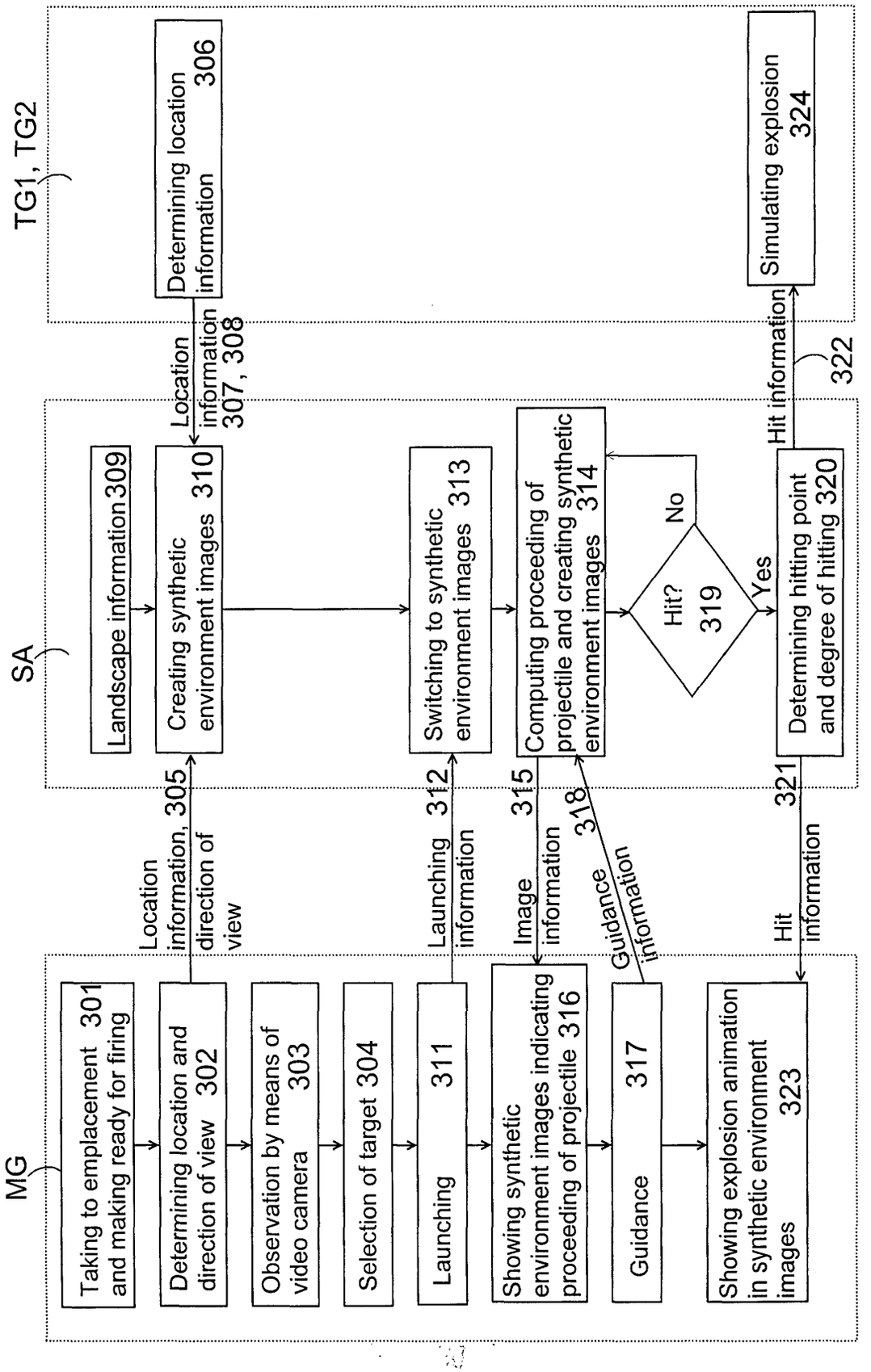
MG
Taking to emplacement and making ready for firing 301
Determining location and direction of view 302
Observation by means of video camera 303
Selection of target 304
Launching 311
Showing synthetic environment images indicating proceeding of projectile 316
Guidance 317
Showing explosion animation in synthetic environment images 323
Location information, direction of view 305
Launching information 312
Image information 315
Guidance information 318
Hit information 321
SA
Landscape information 309
Creating synthetic environment images 310
Switching to synthetic environment images 313
Computing proceeding of projectile and creating synthetic environment images 314
Hit? 319
No
Yes
Determining hitting point and degree of hitting 320
Hit information 322
Location information 307, 308
TG1, TG2
Determining location information 306
Simulating explosion 324

Fig. 3

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 01 66 0125

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
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A	* page 4, line 35 - page 6, line 28; figures 1-3 *	2-6,9, 10, 13-15, 17-19	
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A	GB 2 186 356 A (BARR & STROUD LTD) 12 August 1987 (1987-08-12) * abstract * * page 1, right-hand column, line 90 - page 2, right-hand column, line 88; figures 1,2 *	1,12,16	

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	29 October 2001	Blondel, F

CATEGORY OF CITED DOCUMENTS

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