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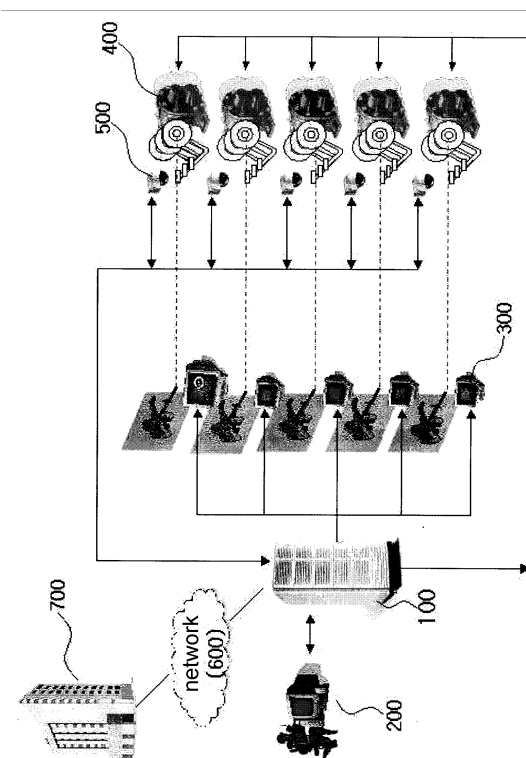
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(54) **SYSTEM FOR SIMULATED FIRING EXERCISE AND METHOD**

(57) The present invention is related to a simulated firing system, which is comprising; a firing control terminal being inputted information of start firing and a target through an input device of a range supervisor; a range management server, which converts the information of the start firing and the target received from the firing control terminal to control signals of the start firing and the target; a target control device, which is automatically replaced a target corresponding to the inputted the target information in the firing control terminal when the target control signal is transmitted from the range management server; a shooter alerting terminal, which displays an image signal or alerts a sound signal through a video or audio units to start firing when the start firing signal received from the range management server; a target shooting camera, which is taking images of the target being pointed a laser beam fired from the shooter's gun in real time when the shooter has recognized a start firing signal through the shooter alerting terminal; Then, the range management server calculates a shooting score on the image target pointed by the laser beam when it is received from the target shooting camera; a higher level troop server, which is evaluated and managed the shooting scores of a lower level troop received via a communication networks.

[Fig. 1]



Description

[Technical Field]

[0001] The present invention is related to a system and method for firing exercise simulation, more particularly, the firing exercise simulation system has provided a detachable laser beam launcher or a trigger pulling device with connecting to a power source. When a shooter pulls the trigger, the laser beam is launched to hit the target for a second. Then, a target image capturing camera will be capturing the images of pointed target for transmitting to a training range server. The upper level troop server collects the pointed target images transmitted via network from the lower level troop server for evaluating the firing scores and enhancing the combat strength.

[Background Art]

[0002] Generally in a military shooting range system, the troop is deployed at the shooting field with a rifle loaded the ammunitions, the soldier aims and fires toward the target posted within a shooting range for shooting training. An observer who is standby nearby the target will evaluate the soldier's shooting scores to verify the hit marks on the target.

[Disclosure]

[Technical Problem]

[0003] However, the aforementioned conventional shooting range system has a serious problem. If someone accidentally miss-fires, it will caused to hurt the human life.

[0004] Additionally, the conventional shooting training requires to be consumed a lot of time and manpower. Furthermore, there is a limitation to improve the shooting capability for the combat troops due to the shortage of the firing ranges. During the shooting training is taking place, the civil complaints incurs due to the firing noise. Due to the consumptions of the huge amount of ammunitions, it is caused to waste the huge defense budget.

[0005] Moreover, there could be miss-communication incurred between the low level troops and the upper level troops. Because an observer has to manually verify the bullet marked target and calculate a firing score every time for the shooter, there are many chances to make the mistakes. As mentioned, there are some problems of in-accuracy calculation with manual evaluating the combat capability.

[0006] Furthermore, the firing exercise will be limited depend on the season and weather. As comparing the number of troops, the number of firing ranges is insufficient. In order to build a new firing range, it requires the enormous budget. Additionally, it also requires a huge land to construct a firing range. It would be caused to destroy the huge forest.

[Technical Solution]

[0007] In order to solve the above described problems, a firing exercise simulation system has developed that is comprising; a firing control terminal (200) being inputted information of start firing and a target range through an input device of a range supervisor; a range management server (100) for converting the information of the start firing and the target range received from the firing control terminal (200) to control signals of the start firing and the target range; a target control device (400) for automatically replacing a target corresponding to the inputted the target information in the firing control terminal (200) when the target control signal is transmitted from the range management server (100); a shooter alerting terminal (300) for displaying an image signal or alerting a sound signal through a video or audio devices to start firing when the start firing signal is received from the range management server (100); a target shooting camera (500) for taking the target images being pointed a laser beam fired from the shooter's gun in real time when the shooter has recognized a start firing signal through the shooter alerting terminal (300); the range management server (100) for calculating a shooting score on the image target pointed by the laser beam when it is received from the target shooting camera (500), and an upper troop server (700) for evaluating and managing the shooting scores of a lower level troop received through a communication network (600).

[0008] Another object of the present invention provides a method of simulated firing exercise, a range management server calculating a firing score based on the target image pointed by a laser beam, and captured by a target image shooting camera, the process is comprising the steps of; (a) retrieving a target information, which is assigned a size and a number classified by ranges from a target DB (160) when a microprocessor (110) of a range management server (100) is received the information of start firing and range from a control terminal (200); (b) converting the target information retrieved from the target DB (160) to a target control signal by the range management server (100), and replacing a target corresponded size and range according to the converted signal controlled by the target control device (400); (c) converting the information of start firing to a signal of start firing, and transmitting the signal of start firing to the shooter

alerting terminal (300) for start firing, by displaying the signal of start firing on a shooter terminal control unit (140) of the range management server (100); (d) capturing images of target pointed by a laser beam by controlling a camera control unit (190) of the range management server (100); (e) receiving the captured target images by the target image capturing camera (500) of the range management server (100) to decide whether the firing start or not, if not, repeating the step (c), (f) if a firing starts in the step (e), extracting a coordinate from the coordinate patterning unit (120) of the range management server (100) for coordinating the captured target image by the target shooting camera (500); (g) calculating a firing score based on the coordinate information, which is extracted by the coordinate patterning unit (120) via the score computing unit (180) of the range management server (100); and (h) storing the firing score in the score DB (170) calculated in step (g) by the firing score computing unit (100), and transmitting the score to the upper level troop sever (700) through network.

[Advantageous Effects]

[0009] The firing exercise simulation system and method of the present invention has merit to avoid the potential accident caused by a miss-firing.

[0010] Further, the simulated firing exercise has merit to remarkably reduce the time consuming and enhancing the combat capability. Because the firing exercise simulation range is possibly built indoor, the firing exercise will not be limited by season and weather.

[0011] Moreover, the simulated firing exercise has merit; it does not generate the explosive noise during the firing exercise. Therefore, the filing of the civil complaints is remarkably reduced. As a result, the military administration can be smoothly performed.

[0012] Moreover, the simulated firing exercise does not use real ammunitions, it has merits to save remarkable defense budget. It also has merit to facilitate sddiers to the DB, so that it is easy to evaluate the combat capability of the individual soldier. Then, the data is delivered to the upper troop through the communications network, so that the upper troop is promptly measured the combat strength of the low troop.

[0013] Moreover, it has an effect to protect the forest because it is able to save huge lands, which is required to build a new firing exercise range.

[Description of Drawings]

[0014] The above and other objects, features and other advantages of the present invention will be more clearly understood from the following detailed description taken in conjunction with the accompanying drawings, in which:

Fig. 1 is a schematic drawing illustrating a system for simulated firing exercise according to the present invention

Fig. 2 is a block diagram showing an internal configuration of firing range management server for the simulated firing exercise system according to the present invention

Fig. 3 is a target image taken by a target shooting camera of the simulated firing exercise system according to the present invention.

Fig. 4 is a main flowchart illustrating a sequential procedure of simulated firing exercise according to the present invention.

Fig. 5 is a sub-flowchart illustrating a process of the firing score computation for the simulated firing exercise according to the present invention.

[Best Mode]

[0015] In order to accomplish the aforementioned merits, the system and method of simulated firing exercise of the present invention will be described with reference to the accompanying drawings.

[0016] Referring to Fig. 1, the firing exercise simulation system of the present invention is comprised of a range management server (100), the firing control terminal (200), the shooter alerting terminal (300), a target control device (400), the target shooting camera (500), a communication network (600) and an upper troop server (700).

[0017] A range supervisor is inputted the information of start firing and a target range to a firing control terminal (200) through an input device, such as a keyboard or mouse. Then, the inputted information will be transmitted to a range management server (100). Thus, the range supervisor is able to monitor the firing result.

[0018] The information of start firing is converted to a signal form and transmitted to the shooter alerting terminal (300). Then, a shooter verifies the signal displayed on a screen of the shooter alerting terminal (300).

[0019] Further, the shooter selects a shooting range, among the ranges (distance information) of 50M, 100M, 150M, 200M and 250M. The shooting range (the distance information) is defined from a shooter and a target.

[0020] Generally, a personal computer (PC: Personal Computer) is widely used as the firing control terminal (200),

which is extended its specification to have capability of the wire/wireless communications.

[0021] On the other hand, Fig. 2 shows the range management server (100), the microprocessor (110), the coordinate patterning unit (120), the target control unit (130), the shooter terminal control unit (140), the target image receiving unit (150), the target DB (160), the score DB (170) and the score computing unit (180).

[0022] The microprocessor (110) will receive the information of start firing and the distance from the commissioner terminal (200). The distance information is selected as a target, which is pre-sorted and pre-stored in the target DB (160). Then, the selected distance information as the target is saved and verified by the dual commissioners.

[0023] A table 1 shows the distance information as the target range stored in the target DB (160) as follows:

target number	Range	The diameter length of target
1	50M	1M
2	100M	0.5M
3	150M	0.33
4	200M	0.25M
5	250M	0.20M

[0024] The firing exercise simulation system of the present invention has provided the target 1, target 2, target 3, target 4 and target 5, which are placed in-lane as actual range distance. But, the difference is that the target size of the firing exercise simulation system is proportionally reduced as actual vision in the real firing range.

[0025] That is, the target DB (160) stores the proportionally reduced ranges. An implemental example, the basis DB shows that the target size of 1M has proportionally reduced for the actual range of 50M, 50% for the actual range of 100M, 33% for the actual range of 150M, 25% for the actual range of 200M, and 20% for the actual range of 250M.

[0026] On the other hand, the microprocessor (110) selects the target assigned a specific size and number, which is corresponding to the distance information transmitted by the firing control terminal (200), and transfers to the target control unit (130).

[0027] Afterward, the target control unit (130) converts the target information to the target control signal. The target information selected from the target DB (160) is corresponding to the target number selected by the microprocessor (110). The target control signal is transmitted for controlling the target control device (400), which is located at the opposite side of each shooter.

[0028] That is, when the target control device (400) is inputted the target control signal, it will be automatically replaced the target with the target number matched to the firing range inputted by a supervisor.

[0029] When the information of start firing is transmitted from the firing control terminal (200), the microprocessor (110) transmits the information of start firing to the shooter terminal control unit (140). Then, the shooter terminal control unit (140) converts the information of start firing to the signal of start firing for transmitting to the shooter alerting terminal (300).

[0030] Thereafter, when the signal of start firing is transmitted from the shooter terminal control unit (140), the shooter alerting terminal (300) displays an image message on the screen of video unit or alert the sound message such as an "OPEN FIRE" through the audio unit.

[0031] When the shooter is recognizing the signal of start firing from the shooter alerting terminal (300) in the form of image or acoustic message, the laser beam is pointed the target for 0~100 MS (millisecond).

[0032] As a reference, the rifle using by the shooter has the attachable-detachable trigger for generating a laser beam. The trigger for generating the laser beam is located inside of the trigger guard, and the butt portion having reaction device.

[0033] Accordingly, when the shooter pulls the trigger for "open fire", a laser beam is generated to hit the target for 0~100 MS (millisecond). At a same time, the butt of the rifle is hit backward to effectively feel the real shooting.

[0034] On the other hand, when a shooter pulls the trigger and at a same time, the target pointed by a laser beam, the target image capturing camera (500) will be taken the image of the pointed target, in real time. The captured image target information is transmitted to the target image receiving unit (150) of the range management server (100)

[0035] The target image information received by the target image receiving unit (150) is transmitted to the microprocessor (110) through the coordinate patterning unit (120).

[0036] When the coordinate patterning unit (120) is received the target image information, it will extract the coordinate, which is pointed by the laser beam on the standard coordinate.

[0037] The above-mentioned standard coordinate is defined as a coordinate, which the shooter desires to obtain the maximum points, which is the full score.

[0038] Referring to Fig. 3, the above-mentioned standard coordinate for setting the pointed target will be explained more specifically.

[0039] As shown in Fig. 3, a coordinate has formed a set of the horizontal axis and the vertical axis. The two axes are crossing each other to form four regions and a point at center, known as an origin, which is coordinates (0, 0). On a target, it has four circles with different diameters at the same origin, in other words, the concentric circle. The origin coordinate (0, 0) is the setting or standard coordinate. If a shooter open fires to the target-coordinate, the bullets (laser beams) will hit to be marked or pointed on the target. Since the shooter open fires, the target will have three marks at located (AX, AY), (BX, BY) and (CX, CY) in the coordinate.

[0040] Accordingly, to target setting coordinate (0, 0) can be set differently depend on the target ranges and types by the firing control terminal (200).

[0041] Since the shooter starts open firing aimed to the setting coordinate (0, 0), a marked target is extracted as a pointed coordinate by the coordinate patterning unit (120). Then, the extracted coordinate is transmitted through the microprocessor (110) to the score computing unit (180).

[0042] When the coordinate patterning unit (120) is received the three marked the coordinate, (AX, AY), (BX, BY) and (CX, CY) with pre-setting coordinate (0, 0), the score computing unit (180) will calculate the firing score of a shooter.

[0043] That is, the score computing unit (180) is consisted of the distance calculating unit (182), the distance comparison unit (183), the score settlement unit (184), and the block distance score DB (181). The distance calculating unit (182) calculates the distance between the setting coordinate (0, 0) as the standard coordinate and the pointed coordinate in a target, which is pointed by the shooters firing.

[0044] Further, the distance comparison unit (183) verifies the allocations in the circular zone by comparing the distance calculated by the distance calculating unit (182) with pre-inputted radius and size in the block distance score DB (181).

[0045] The table 2 shows the block distance score DB (181) stored the different scores depending on the allocated distance.

The pointed coordinate section	The allocated score
0cm~2cm	10 point
2cm~4cm	8 point
4cm~6cm	6 point
6cm~8cm	4 point
8cm~10cm	2 point

[0046] As shown in Fig. 3, the radius of each concentric circle is 2cm, 4cm, 6cm and 8cm, respectively. When a shooter launches the laser beam, it will hit the target. If the laser beam hits within a radius of 2cm circle, which is 10 points, within a radius of 2cm~4cm, which is 8 points, within a radius of 4cm~6cm, which is 6 points, within a radius of 6cm~8cm, which is 4 points, within a radius of 8cm~10cm, which is 2 points settled by the distance settlement part (184).

[0047] For example, the firing score for the target shown in Fig. 3, since the target has pointed distance from the setting coordinate (0, 0) within 2cm, the calculation of the coordinate (AX, AY) will be 10 points. The second pointed distance from the setting coordinate (0, 0) calculates the coordinate (BX, BY) will be 8 points since it marked between 2cm and 4cm. The third pointed distance from the setting coordinate (0, 0) calculates the coordinate (CX, CY) will be 6 points since it pointed between 4cm and 6cm. The shooter gets the total score of 24 points, and the average score is 8 points.

[0048] The firing score of the shooter calculated by the score computing unit (180) is transmitted to the microprocessor (110). The calculated score is stored in the score DB (170) corresponding to the microprocessor (110).

[0049] In order to evaluate the combat capability of a specific low level troop, the upper level troop requests the firing score of the low level troop members. The firing score of the shooters stored in the score DB (170) of the range management server (100) is transmitted to the troop server (700) through the communication network (600).

[0050] Moreover, the range management server (100) transmits the target image captured by the target image capturing camera (500) and the score calculated by the score computing unit (180) to the firing control terminal (200) and the target control device (400) for monitoring the shooting result.

[0051] Particularly, the shooter can check-out the problems, such as a top right built hit, left top built hit, through evaluating the firing result transmitted to the target control device (400) and correcting the problems by adjusting the front sight

[0052] Furthermore, the target control device (400) displays to instruct the shooter how he can manages the shooting at a windy weather by simulating the situations...

[0053] Hereinafter, a firing exercise simulating method of the present invention will be described with reference to the accompanying drawings Fig. 4 and Fig. 5.

[0054] Firstly, the range management server (100) is received the information of start firing and range from a control

terminal (200) (S1);

[0055] The range management server (100) selects a target having specific size and number from the target DB (160) according to the range information received from the control terminal (200)(S2).

[0056] That is, the microprocessor (110) of the range management server (100) retrieves the target information, which has an actual diameter of 0.1 M, the target number 1 and the firing range of 100M. The target number 1 with a firing range of 100M is selected from the target DB (160), which is database, such as a table 1.

[0057] The target control unit (130) of the range management server (100) converts the target information to the target control signal for controlling the target control device (400) (S3).

[0058] That is, when the target control unit (130) of the range management server (100) transmits the target control signal to the target control device (400), the target control device (400) replaces the target, which is corresponding to the target information retrieved from the target DB.

[0059] Further, the shooter terminal control unit (140) of the range management server (100) converts the information of start firing to the signal of start firing for controlling the shooter alerting terminal (300) (S4);

[0060] That is, the shooter terminal control unit (140) of the range management server (100) transmits the signal of start firing in the form of image or acoustic to the shooter alerting terminal (300), so that the shooter starts firing to a target replaced by the target control device (400).

[0061] When the shooter terminal control unit (140) transmits the signal of start firing, at the same time, the camera control unit (190) of the range management server (100) transmits the control signal for activating the target image capturing camera (500) (S5);

[0062] When the target image capturing camera (500) receives the control signal from the camera control unit (190) to capture the target images, the target image receiving unit (150) of the range management server (100) receives the target images captured in real time by the target image capturing camera (500) (S6).

[0063] Thereafter, the range management server (100) determines whether the shooter starts firing based on the target image information captured in real time by the target image capturing camera (500) (S7).

[0064] That is, when the target image receiving unit (150) is receiving the information of the target image captured in a real time, if the target image does not pointed by the laser beam, the microprocessor (110) of the range management server (100) determines the shooter does not fired, yet. Then, a signal of start firing is transmitted again to the shooter alerting terminal (300) to repeat the step S4.

[0065] On the other hand, when the target image receiving unit (150) receives the information of the target image captured in a real time, if the target image is pointed by the laser beam, then, the coordinate patterning unit (120) of the range management server (100) executes to extract the pointed coordinate (S8).

[0066] When the coordinate patterning unit (120) extracts the coordinate information, the score computing unit (180) of the range management server (100) calculates the firing score of the shooter by using aforementioned method of the firing exercise simulation system (S9).

[0067] That is, the step S9 calculates the distance between the coordinate extracted by the coordinate patterning unit (120) and the standard coordinate, which the full point is allocated by the distance calculating unit (182) of the score computing unit (180).

[0068] The distance comparison unit (183) of the score computing unit (180) confirms the scores of the calculated distance as matched the score allocated on the block distance, where belong to the calculated distance, and comparing the distance and score calculated by the distance calculating unit (182) with the allocated distance, and the score settlement unit (184) of the score computing unit (180) verifies where the calculated distance is belonged to a score zone.

[0069] When the shooter's score is calculated at the step S9, the microprocessor (110) stores the calculated scores of the shooter. Then, the target image capturing camera (500) transmits to the target image information to the firing control terminal (200), the shooter alerting terminal (300) and the upper level troop sever (700) (S10).

[0070] That is, the shooter's score and the target image information are transmitted to the shooter alerting terminal (300) the firing control terminal (200) for monitoring the shooting result by the supervisor and shooter.

[0071] Moreover, the shooter's score and the target image information are transmitted to the upper level troop sever (700), so that the combat capability is easily evaluated by the upper unit.

[0072] While this invention has been described in connection with what is presently considered to be the most practical and preferred embodiment, it is to be understood that the invention is not limited to the disclosed embodiment and the drawings, but, on the contrary, it is intended to cover various modifications and variations within the spirit and scope of the appended claims.

Claims

1. A system for simulated firing exercise, the system comprising that;
a firing control terminal (200) being inputted information of start firing and a target range through an input device of

a range supervisor;

a range management server (100) for converting the information of the start firing and the target range received from the firing control terminal (200) to control signals of the start firing and the target range;

a target control device (400) for automatically replacing a target corresponding to the inputted the target information in the firing control terminal (200) when the target control signal is transmitted from the range management server (100);

a shooter alerting terminal (300) for displaying an image signal or alerting a sound signal through a video or audio devices to start firing when the start firing signal is received from the range management server (100);

a target shooting camera (500) for taking the target images being pointed a laser beam fired from the shooter's gun in real time when the shooter has recognized a start firing signal through the shooter alerting terminal (300);

said range management server (100) for calculating a shooting score on the image target pointed by the laser beam when it is received from the target shooting camera (500),

a higher level troop server (700) for evaluating and managing the shooting scores of a lower level troop received through a communication network (600).

2. The system according to claim 1, the range management server (100) further comprising;

a target control unit (130) for controlling the target control device (400) to convert the information of the target range received from the firing control terminal (200) to a signal of the target range;

a shooter terminal control unit (140) controls the shooter alerting terminal (300) for converting the firing start information received from the firing control terminal (200) to a signal of a firing start;

a camera control unit (190) controls the target image capturing camera (500) for taking the target images being pointed the laser beam in real time according to the firing start signal;

a target image receiving unit (150) for receiving the target images pointed by the laser beam received from the target shooting camera (500);

a coordinate patterning unit (120) for coordinating the target images pointed the laser beam overlapping a standard coordinate pattern, said target images received from the target image receiving unit (150);

a score computing unit (180) for calculating a shooter's firing score according to the coordinated target images transmitted from the coordinate patterning unit (120); and

a score DB (170) for storing and managing the shooters firing scores calculates by the score computing unit (180).

3. The system according to claim 2, said score computing unit (180) further comprising;

a block distance score DB (181) for storing the scores, which are differently allocated and stored in a form of a table according to the patterned distances between the standard coordinate;

a distance calculating unit (182) for calculating the distance, which is extracted between the coordinate patterning unit (120) and the standard coordinate;

a distance comparison unit (183) for comparing the distances, which are allocated the different scores in the block distance score DB (181) with the distance scores calculated by the distance calculating unit (182); and

a score settlement unit (184) for settling a assigned score, which is verified and sorted the point level corresponding to the distance section calculated by the distance calculating unit (182) according to the comparison by the distance comparison unit (183).

4. A method of simulated firing exercise, a range management server calculating a firing score based on the target image pointed by a laser beam, and captured by a target image shooting camera, the process is comprising the steps of;

(a) retrieving a target information, which is assigned a size and a number classified by ranges from a target DB (160) when a microprocessor (110) of a range management server (100) is received the information of start firing and range from a control terminal (200);

(b) converting the target information retrieved from the target DB (160) to a target control signal by the range management server (100), and replacing a target corresponded size and range according to the converted signal controlled by the target control device (400);

(c) converting the information of start firing to a signal of start firing, and transmitting the signal of start firing to the shooter alerting terminal (300) for start firing, by displaying the signal of start firing on a shooter terminal control unit (140) of the range management server (100);

(d) capturing images of target pointed by a laser beam by controlling a camera control unit (190) of the range management server (100);

(e) receiving the captured target images by the target image capturing camera (500) of the range management server (100) to decide whether the firing start or not, if not, repeating the step (c),

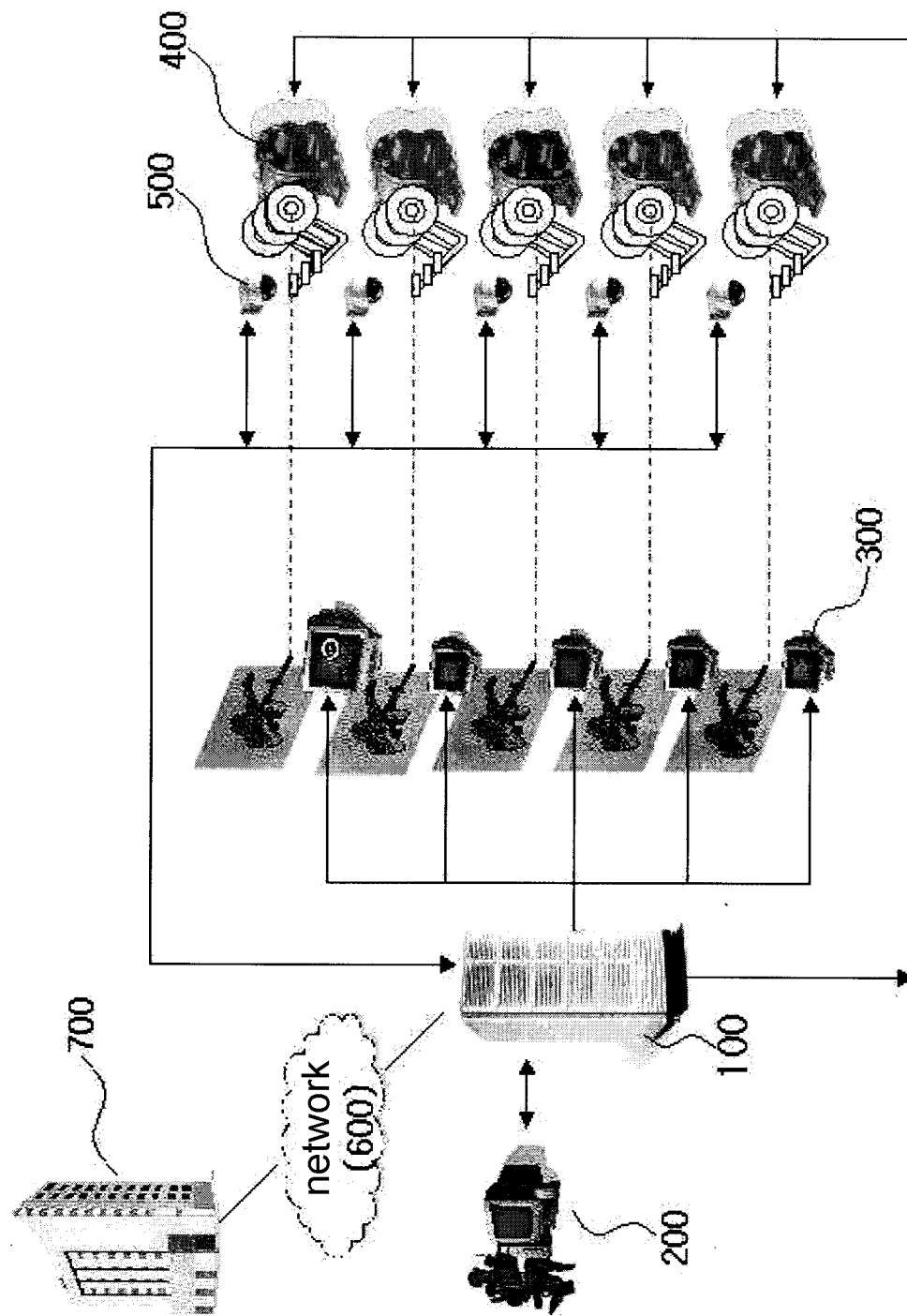
(f) if a firing starts in the step (e), extracting a coordinate from the coordinate patterning unit (120) of the range management server (100) for coordinating the captured target image by the target shooting camera (500);
 (g) calculating a firing score based on the coordinate information, which is extracted by the coordinate patterning unit (120) via the score computing unit (180) of the range management server (100); and
 (h) storing the firing score in the score DB (170) calculated in step (g) by the firing score computing unit (100), and transmitting the score to the upper level troop sever (700) through network.

5. The method according to claim 4, the calculating step (g) is further comprising the sub-step of;

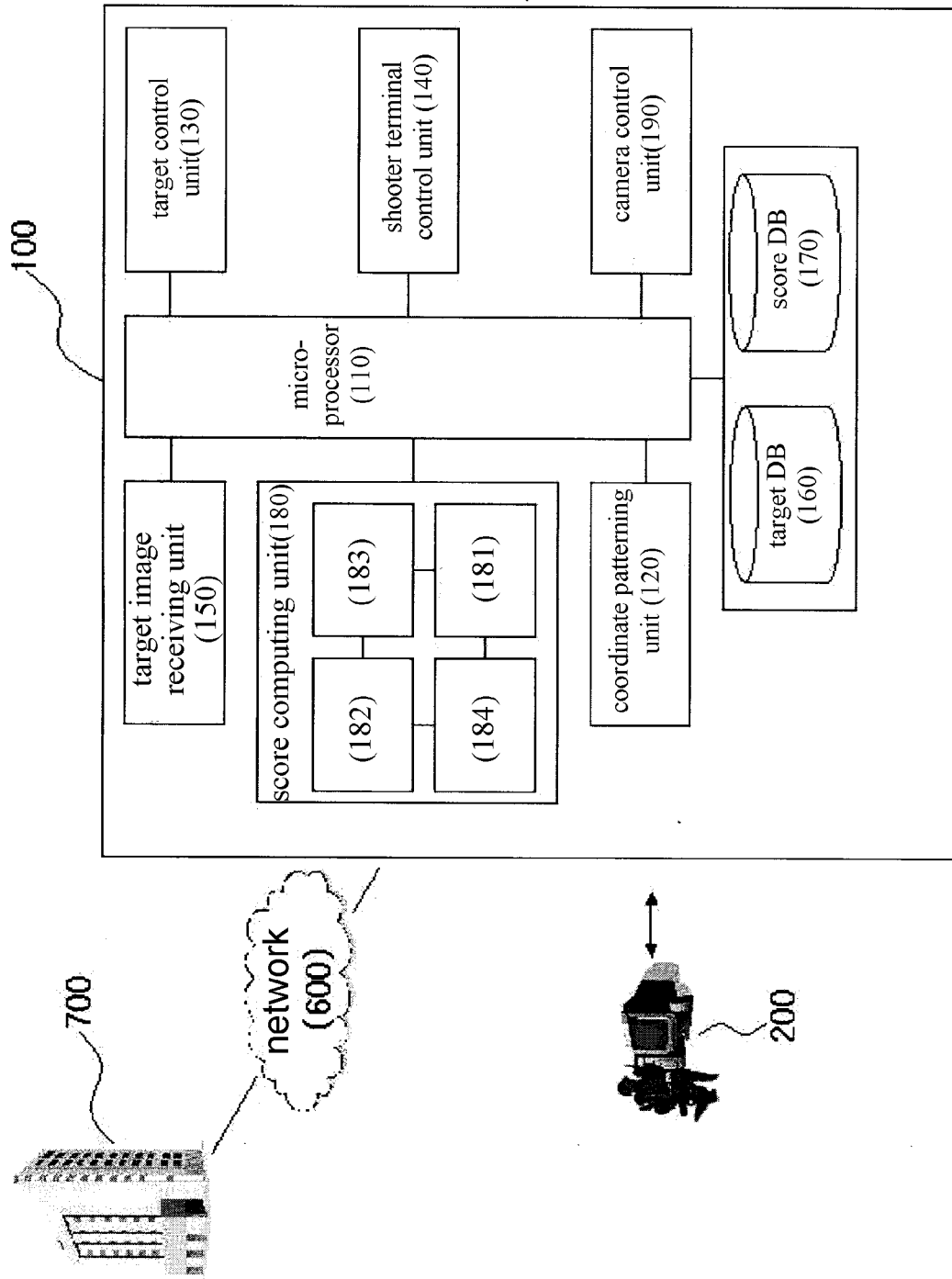
(g-1) calculating a distance between the coordinate extracted by the coordinate patterning unit (120) and the standard coordinate as full point assigned by distance calculating unit (182) of the score computing unit (180);
 (g-2) comparing an allocated block distance and the distance and score by the distance comparison unit (183) of the score computing unit (180), wherein the distance and score are calculated by the distance calculating unit (182); and
 (g-3) verifying a score and a score zone of the distance calculated by the distance calculating unit (182), and settling the score of the calculated distance as an allocated score of the block distance, which is belong to the calculated distance by the score settlement unit (184) of the score computing unit (180).

6. The method according to claim 4, the transmitting step (h) is further comprising the sub-step of;
 transmitting a shooter's firing score calculated in calculating step (g) by the firing score computing unit (100) to the shooter alerting terminal (300) and the firing control terminal (200).

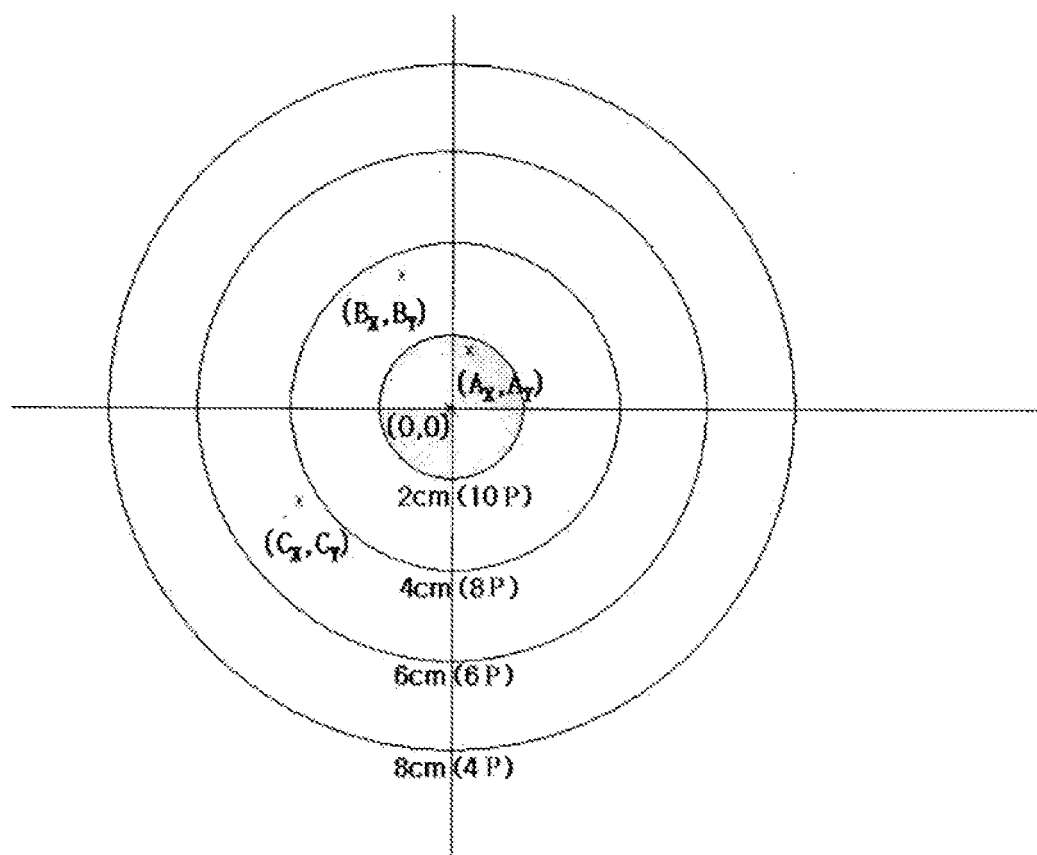
【Fig. 1】



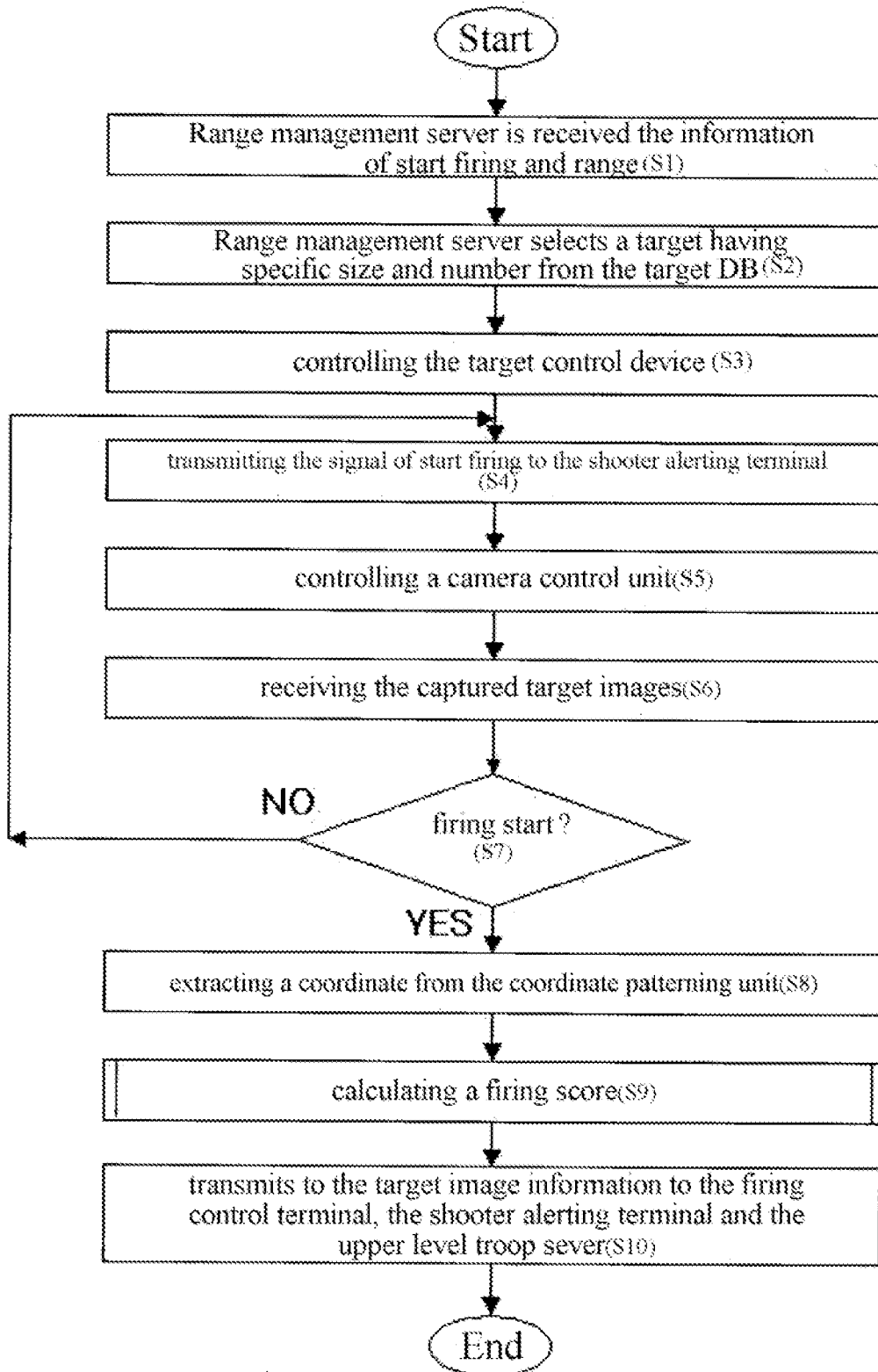
【Fig. 2】



【Fig. 3】



【Fig. 4】



【Fig. 5】

