[DESCRIPTION]

[Title of Invention]

EVENT DETECTING APPARATUS, EVENT DETECTING METHOD, AND STORAGE MEDIUM

[Technical Field]

[0001]

The present disclosure generally relates to event detecting apparatus, event detecting method, and storage medium.

[Background Art]

[0002]

There are techniques to use a video data to monitor objects. PTL1 discloses a technique to detect the center of mass of a person from each one of video frames and recognizes behaviors of that person based on a trajectory of the center of mass of that person.

[Citation List]

[Patent Literature]

[0003]

[PTL1] Japanese Unexamined Patent Application Publication No.2009-075802

[Summary of Invention]

[Technical Problem]

[0004]

Information that can be used to monitor objects based on a video data is not limited to the centers of mass of those objects. Embodiments of the present disclosure are to provide a novel technique to monitor objects based on a video data on which those objects are captured.

[Solution to Problem]

[0005]

According to a first aspect of the present disclosure, there is provided an event detecting apparatus including: at least one memory that is configured to store instructions; and at least one processor.

The at least one processor is configured to execute the instructions to: acquire one or more video data; generate, from the one or more video data, object relationship information that indicates two or more action-related relationships between objects; acquire an event information that indicates an event of interest by a sequence of action-related situations at least one of which represents a situation in which a specific action is taken by a specific subject; and determine whether or not the event of interest occurs based on the object relationship information and the

event information

, wherein it is determined that the event of interest occurs when the object relationship information includes a sequence of the action-related relationships that matches the sequence of the action-related situations indicated by the event information, wherein the event information includes a first action-related situation, a second action-related situation, and a third action-related situation, wherein each one of the first action-related situation and the third action-related situation represents a situation in which a specific action is taken by a specific subject during a specific duration, wherein the second action-related situation represents a situation in which a specific action is not taken by a specific subject during a specific duration, and wherein it is determined that the event of interest occurs when the object relationship information includes a first action-related relationship matching the first action-related situation and a third action-related relationship matching the third action-related situation in this order and when the object relationship information includes no action-related relationship that matches an action-related situation opposite to the second action-related situation.

[0006]

According to a second aspect of the present disclosure, there is provided an event detecting method including: acquiring one or more video data; generating, from the one or more video data, object relationship information that indicates two or more action-related relationships between objects; acquiring an event information that indicates an event of interest by a sequence of action-related situations at least one of which represents a situation in which a specific action is taken by a specific subject; and determining whether or not the event of interest occurs based on the object relationship information and the event information, wherein it is determined that the event of interest occurs when the object relationship information includes a sequence of the action-related relationships that matches the sequence of the action-related situations indicated by the event information, wherein the event information includes a first action-related situation, a second action-related situation, and a third action-related situation, wherein each one of the first action-related situation and the third action-related situation represents a situation in which a specific action is taken by a specific subject during a specific duration, wherein the second action-related situation represents a situation in which a specific action is not taken by a specific subject during a specific duration, and wherein it is determined that the event of interest occurs when the object relationship information includes a first action-related relationship matching the first action-related situation and a third action-related relationship matching the third action-related situation in this order and when the object relationship information includes no action-related relationship that matches an action-related situation opposite to the second action-related situation.

[0007]

According to a third aspect of the present disclosure, there is provided a storage medium storing a program that causes a computer to execute: acquiring one or more video data; generating, from the one or more video data, object relationship information that indicates two or more action-related relationships between objects; acquiring an event information that indicates an event of interest by a sequence of action-related situations at least one of which represents a situation in which a specific action is taken by a specific subject; and determining whether or not the event of interest occurs based on the object relationship information and the event information, wherein it is determined that the event of interest occurs when the object relationship information includes a sequence of the action-related relationships that matches the sequence of the action-related situations indicated by the event information, wherein the event information includes a first action-related situation, a second action-related situation, and a third action-related situation, wherein each one of the first action-related situation and the third action-related situation represents a situation in which a specific action is taken by a specific subject during a specific

duration, wherein the second action-related situation represents a situation in which a specific action is not taken by a specific subject during a specific duration, and wherein it is determined that the event of interest occurs when the object relationship information includes a first action-related relationship matching the first action-related situation and a third action-related relationship matching the third action-related situation in this order and when the object relationship information includes no action-related relationship that matches an action-related situation opposite to the second action-related situation.

[Advantageous Effects of Invention]

[0008]

Embodiments of the present disclosure provide a novel technique to monitor objects based on a video data on which those objects are captured.

[Brief Description of Drawings]

[0009]

[Fig. 1]

Fig. 1 illustrates an overview of an event detecting apparatus.

[Fig. 2]

Fig. 2 is a block diagram illustrating an example of the functional configuration of the event detecting apparatus.

[Fig. 3]

Fig. 3 is a block diagram illustrating an example of the hardware configuration of a computer 1000 realizing the event detecting apparatus.

[Fig. 4]

Fig. 4 is a flowchart illustrating an example flow of processing performed by the event detecting apparatus.

[Fig. 5]

[CLAIMS]

[Claim 1]

An event detecting apparatus comprising:

at least one memory that is configured to store instructions; and

at least one processor that is configured to execute the instructions to:

acquire one or more video data;

generate, from the one or more video data, object relationship information that indicates two or more action-related relationships between objects;

acquire an event information that indicates an event of interest by a sequence of action-related situations at least one of which represents a situation in which a specific action is taken by a specific subject; and

determine whether or not the event of interest occurs based on the object relationship information and the event information,

wherein it is determined that the event of interest occurs when the object relationship information includes a sequence of the action-related relationships that matches the sequence of the action-related situations indicated by the event information

wherein the event information includes a first action-related situation, a second action-related situation, and a third action-related situation,

wherein each one of the first action-related situation and the third action-related situation represents a situation in which a specific action is taken by a specific subject during a specific duration,

wherein the second action-related situation represents a situation in which a specific action is not taken by a specific subject during a specific duration, and

wherein it is determined that the event of interest occurs when the object relationship information includes a first action-related relationship matching the first action-related situation and a third action-related relationship matching the third action-related situation in this order and when the object relationship information includes no action-related relationship that matches an action-related situation opposite to the second action-related situation.

[Claim 2]

The event detecting apparatus according to Claim 1,

wherein the temporal action-related relationship indicates a combination of an action, a subject of the action, and an object of the action,

wherein the action-related situation indicates a combination of an action, a subject of the action, and an object of the action, and

wherein the temporal action-relate relationship is determined to match the action-related situation when the action, the subject of the action, and the object of the action indicated by the temporal action-related relationship respectively match the action, the subject of the action, and the object of the action indicated by the action-related situation.

[Claim 3]

The event detecting apparatus according to Claim 1 or 2,

wherein the event information includes a first action-related situation and a second action-related situation in this order, and

wherein it is determined that the event of interest occurs when the object relationship information includes a first action-related relationship matching the first action-related situation and a second action-related relationship matching the second action-related situation in this order.

[Claim 4]

The event detecting apparatus according to any one of Claims 1 to 3,

wherein the event information indicates two or more objects that are of a same type as each other and are different from each other in a distinguishable manner.

[Claim 5]

The event detecting apparatus according to any one of Claims 1 to 4,

wherein the object relationship information represents a sequence of scene graphs each of which represents relationships between objects that exist at a time or during a period of time.

[Claim 6]

An event detecting method comprising:

acquiring one or more video data;

generating, from the one or more video data, object relationship information that indicates two or more action-related relationships between objects;

acquiring an event information that indicates an event of interest by a sequence of action-related situations at least one of which represents a situation in which a specific action is taken by a specific subject; and

determining whether or not the event of interest occurs based on the object relationship information and the event information,

wherein it is determined that the event of interest occurs when the object relationship information includes a sequence of the action-related relationships that matches the sequence of the action-related situations indicated by the event information,

wherein the event information includes a first action-related situation, a second action-related situation, and a third action-related situation,

wherein each one of the first action-related situation and the third action-related situation represents a situation in which a specific action is taken by a specific subject during a specific duration,

wherein the second action-related situation represents a situation in which a specific action is not taken by a specific subject during a specific duration, and

wherein it is determined that the event of interest occurs when the object relationship information includes a first action-related relationship matching the first action-related situation and a third action-related relationship matching the third action-related situation in this order and when the object relationship information includes no action-related relationship that matches an action-related situation opposite to the second action-related situation.

[Claim 7]

The event detecting method according to Claim 6,

wherein the temporal action-related relationship indicates a combination of an action, a subject of the action, and an object of the action,

wherein the action-related situation indicates a combination of an action, a subject of the action, and an object of the action, and

wherein the temporal action-relate relationship is determined to match the action-related situation when the action, the subject of the action, and the object of the action indicated by the temporal action-related relationship respectively match the action, the subject of the action, and the object of the action indicated by the action-related situation.

[Claim 8]

The event detecting method according to Claim 6 or 7,

wherein the event information includes a first action-related situation and a second action-related situation in this order, and

wherein it is determined that the event of interest occurs when the object relationship

information includes a first action-related relationship matching the first action-related situation and a second action-related relationship matching the second action-related situation in this order.

[Claim 9]

The event detecting method according to any one of Claims 6 to 8,

wherein the event information indicates two or more objects that are of a same type as each other and are different from each other in a distinguishable manner.

[Claim 10]

The event detecting method according to any one of Claims 6 to 9,

wherein the object relationship information represents a sequence of scene graphs each of which represents relationships between objects that exist at a time or during a period of time.

[Claim 11]

A storage medium storing a program that causes a computer to execute:

acquiring one or more video data;

generating, from the one or more video data, object relationship information that indicates two or more action-related relationships between objects;

acquiring an event information that indicates an event of interest by a sequence of action-related situations at least one of which represents a situation in which a specific action is taken by a specific subject; and

determining whether or not the event of interest occurs based on the object relationship information and the event information

wherein it is determined that the event of interest occurs when the object relationship information includes a sequence of the action-related relationships that matches the sequence of the action-related situations indicated by the event information,

wherein the event information includes a first action-related situation, a second action-related situation, and a third action-related situation,

wherein each one of the first action-related situation and the third action-related situation represents a situation in which a specific action is taken by a specific subject during a specific duration,

wherein the second action-related situation represents a situation in which a specific action is not taken by a specific subject during a specific duration, and

wherein it is determined that the event of interest occurs when the object relationship information includes a first action-related relationship matching the first action-related situation and a third action-related relationship matching the third action-related situation in this order and when the object relationship information includes no action-related relationship that matches an action-related situation opposite to the second action-related situation.

[Claim 12]

The storage medium according to Claim 11,

wherein the temporal action-related relationship indicates a combination of an action, a subject of the action, and an object of the action,

wherein the action-related situation indicates a combination of an action, a subject of the action, and an object of the action, and

wherein the temporal action-relate relationship is determined to match the action-related situation when the action, the subject of the action, and the object of the action indicated by the temporal action-related relationship respectively match the action, the subject of the action, and the object of the action indicated by the action-related situation.

[Claim 13]

The storage medium according to Claim 11 or 12,

wherein the event information includes a first action-related situation and a second action-related situation in this order, and

wherein it is determined that the event of interest occurs when the object relationship information includes a first action-related relationship matching the first action-related situation and a second action-related relationship matching the second action-related situation in this order.