CLAIMS

1. A computer-implemented method, comprising:

receiving, by a computing system, data specifying visual attributes of a particular object detected in an image of a sequence of images;

obtaining, by the computing system, a tracked object profile for each tracked object in a set of tracked objects that have been previously detected in the sequence of images, the tracked object profile for each tracked object specifying (i) visual attributes of the tracked object and (ii) a tracked object identifier for the tracked object;

determining, by the computing system, that the particular object that was detected in the image is a same object as a particular tracked object in the set of tracked objects that was previously detected in the sequence of images, the determining comprising:

for one or more tracked objects in the set of tracked objects:

determining, for each of one or more visual attributes of the tracked object specified by the tracked object profile for the tracked object, a similarity score that represents a measure of similarity between the visual attribute of the tracked object and a corresponding visual attribute of the particular object;

normalizing the similarity score for each of the one or more visual attributes of the tracked object using a normalization function for the visual attribute, wherein the normalization function for at least one visual attribute is different from the normalization function for at least one different visual attribute;

determining an overall similarity score for the tracked object based on each normalized similarity score for each of the one or more visual attributes of the tracked object, the overall similarity score representing an overall measure of visual similarity between the tracked object and the particular object;

determining, based on the overall similarity score for each of the one or more tracked objects including the particular tracked object, that the particular object is the same object as the particular tracked object; and

in response to determining that the particular object is the same object as the particular tracked object, associating the tracked object identifier for the particular tracked object with the particular object in the image of the sequence of images.

2. The method of claim 1, wherein associating the tracked object identifier for the particular tracked object with the particular object in the image of the sequence of images comprises storing, with the image, data specifying the tracked object identifier and a location of the particular object in the image.

3. The method of claim 1, wherein determining the overall similarity score for the tracked object based on the combination of the normalized similarity score for each visual attribute of the tracked object comprises determining a sum of a baseline score and the normalized similarity score for each visual attribute of the tracked object.

4. The method of claim 3, wherein the baseline score is based on a number of objects detected in the image.

5. The method of claim 1, wherein determining, for each visual attribute of the tracked object specified by the tracked object profile for the tracked object, the similarity score that represents a measure of similarity between the visual attribute of the tracked object and the corresponding visual attribute of the particular object comprises:

for each visual attribute of the tracked object:

providing the visual attribute of the tracked object and the corresponding visual attribute of the particular object as input to a dedicated attribute model for a type of attribute of the visual attribute of the tracked object, wherein the attribute model for each type of attribute is different from the attribute model for each other type of attribute; and

receiving, as an output of the dedicated attribute model, the similarity score that represents the measure of similarity between the visual attribute of the tracked object and the corresponding visual attribute of the particular object.

6. The method of claim 1, wherein:

the one or more visual attributes of the tracked object include multiple visual attributes; and

determining an overall similarity score for the tracked object based on each

normalized similarity score for each of the one or more visual attributes of the tracked object comprises determining, as the overall similarity score, a combination of the normalized similarity scores for the multiple visual attributes.

7. The method of claim 1, wherein the normalization function for each visual attribute is based on an assigned distinctiveness of the visual attribute.

8. The method of claim 1, wherein:

each normalization function for each visual attribute specifies a range of values for the normalized similarity score determined using the normalization function;

the range of values of one or more of the normalization functions includes a negative subrange that include one or more negative values and a positive subrange that includes one or more positive values; and

each subrange is based on a first measure of likelihood that two objects for which the visual attribute matches are a same object and a second measure of likelihood that two objects for which the visual attribute does not match are not the same object.

9. The method of claim 1, wherein the sequence of images is part of a video, the method further comprising determining that a given tracked object in the set of tracked objects has not been detected in at least a threshold duration of the video since a last image in which the given tracked object was detected and, in response, removing the given tracked object from the set of tracked objects.

10. The method of claim 1, wherein:

the sequence of images includes images captured by multiple cameras;

the attributes of the particular object includes an attribute specifying a camera of the multiple cameras that captured the image; and

the tracked object profile for each tracked object comprises data specifying one or more cameras that captured an image in which the tracked object was detected and, for each camera, one or more times the tracked object was detected in an image captured by the camera.

11. The method of claim 1, further comprising updating the tracked object profile for the particular tracked object in response to determining that the particular object is the same object as the particular tracked object, the updating including updating the visual attributes of the particular tracked object based on the visual attributes of the particular tracked object.

12. The method of claim 11, wherein updating the visual attributes of the particular tracked object based on the visual attributes of the particular tracked object comprises determining a combined visual attribute for at least one visual attribute of the particular tracked object by combining the visual attribute of the particular tracked object with the corresponding visual attribute of the particular object.

13. A computer-implemented method, comprising:

receiving, by a computing system, data specifying visual attributes of a particular object detected in an image;

identifying, by the computing system, data specifying visual attributes of a tracked object;

determining a level of similarity between the particular object detected in the image and the tracked object based on comparison of visual attributes of the particular object with corresponding visual attributes of the tracked object, including normalizing similarities for the compared visual attributes, wherein a first normalization function used to normalize a level of similarity between first corresponding visual attributes of the particular object and the tracked object is different from a second normalization function used to normalize a level of similarity between second corresponding visual attributes of the particular object and the tracked object;

determining, based on the level of similarity between the particular object detected in the image and the tracked object, whether the particular object matches the tracked object; and

providing an indication of whether the particular object matches the tracked object.

14. The method of claim 13, wherein determining a level of similarity between the particular object detected in the image and the tracked object comprises determining, as the level of similarity, a combination of the normalized similarities for the visual attributes.

15. The method of claim 13, wherein the first normalization function is based on an assigned distinctiveness of the first corresponding visual attributes and the second normalization function is based on an assigned distinctiveness of the second corresponding visual attributes.

16. The method of claim 13, wherein:

each normalization function for each visual attribute specifies a range of values for a normalized similarity determined using the normalization function;

the range of values of one or more of the normalization functions includes a negative subrange that include one or more negative values and a positive subrange that includes one or more positive values; and

each subrange is based on a first measure of likelihood that two objects for which the visual attribute matches are a same object and a second measure of likelihood that two objects for which the visual attribute does not match are not the same object.

17. A computer program product, encoded on one or more non-transitory computer storage media, comprising instructions that when executed by one or more computers cause the one or more computers to perform operations comprising:

receiving, by a computing system, data specifying visual attributes of a particular object detected in an image;

identifying, by the computing system, data specifying visual attributes of a tracked object;

determining a level of similarity between the particular object detected in the image and the tracked object based on comparison of visual attributes of the particular object with corresponding visual attributes of the tracked object, including normalizing similarities for the compared visual attributes, wherein a first normalization function used to normalize a level of similarity between first corresponding visual attributes of the particular object and

the tracked object is different from a second normalization function used to normalize a level of similarity between second corresponding visual attributes of the particular object and the tracked object;

determining, based on the level of similarity between the particular object detected in the image and the tracked object, whether the particular object matches the tracked object; and

providing an indication of whether the particular object matches the tracked object.

18. The computer program product of claim 17, wherein determining a level of similarity between the particular object detected in the image and the tracked object comprises determining, as the level of similarity, a combination of the normalized similarities for the visual attributes.

19. The computer program product of claim 17, wherein the first normalization function is based on an assigned distinctiveness of the first corresponding visual attributes and the second normalization function is based on an assigned distinctiveness of the second corresponding visual attributes.