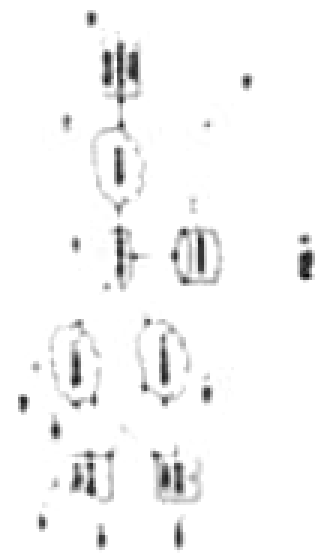
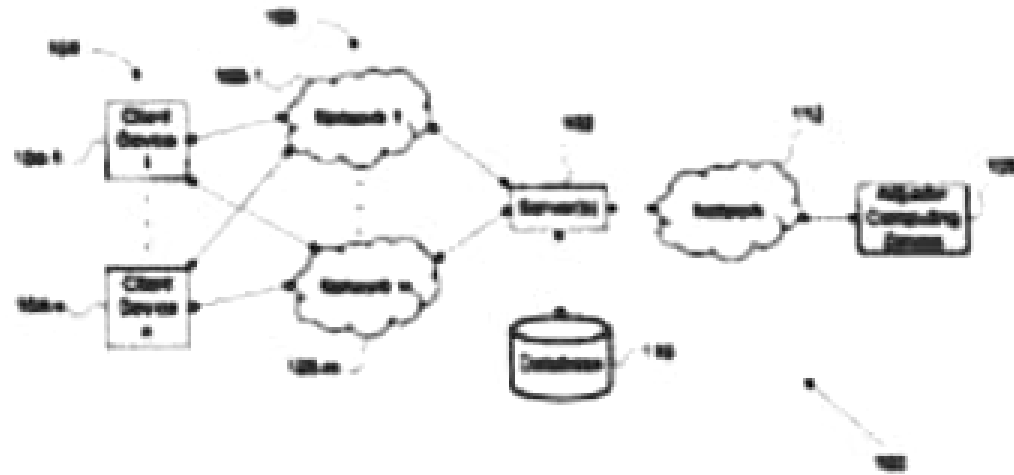


Abstract

A system and method are provided for automatically estimating a repair cost for a vehicle. A method includes: receiving, at a server computing device over an electronic network, one or more images of a damaged vehicle from a client computing device; performing image processing operations on each of the one or more images to detect external damage to a first set of parts of the vehicle; inferring internal damage to a second set of parts of the vehicle based on the detected external damage; and, calculating an estimated repair cost for the vehicle based on the detected external damage and inferred internal damage based on accessing a parts database that includes repair and labor costs for each part in the first and second sets of parts.



What is claimed is:

1. A method for automatically estimating a repair cost for a vehicle, comprising:

receiving, at a server computing device over an electronic network, one or more images of a damaged vehicle from a client computing device;

performing computerized image processing on each of the one or more images to detect damage to a set of parts of the vehicle; and

calculating an estimated repair cost for the vehicle based on the detected damage based on accessing a parts database that includes repair costs.

2. The method of claim 1, wherein said detecting damage includes estimating external damage to a first set of parts of the vehicle and inferring internal damage to a second set of parts based on detected external damage.

3. The method of claim 1, wherein said database or repair costs includes estimates for parts and labor for individual parts.

4. The method of claim 1, wherein performing image processing on each of the one or more images includes:

removing artifacts from a first image of the one or more images;

aligning the first image to an undamaged version of the vehicle;

5. The method of claim 4, wherein removing artifacts from the first image includes:

removing background material from the first image; and

removing specular reflection due to incident light on the vehicle shown in the first image.

6. The method of claim 4, wherein performing damage assessment includes:

comparing each of edge distribution, texture comparison, and spatial correlation of portions of each vehicle part in the first image to corresponding portions of each vehicle part in the undamaged version of the vehicle; and

determining whether the edge distribution, the texture comparison, and the spatial correlation exceed respective threshold difference values.

7. The method of claim 4, wherein damage is detected in a portion of a vehicle part in the first image if any one of the edge distribution, the texture comparison, and the spatial correlation exceeds the respective threshold difference value.

8. The method of claim 1, wherein performing image processing on each of the one or more images includes:

training a first Convolutional Neural Network (CNN) to detect a pose of a vehicle;

training a plurality of CNNs to detect damage to a respective plurality of external vehicle parts;

receiving a first image of the one or more images of the damaged vehicle;

executing the first CNN to detect the pose of the vehicle in the first image;

9. A mobile device comprising a camera, a display device, a processor, and a memory, the memory storing instructions that, when executed by the processor, cause the mobile device to display prompts on the display device to capture damage to a vehicle with the camera, by performing the steps of:

receiving, in a first user interface screen displayed on the display device, a selection to initiate a new vehicle claim;

displaying, in a second user interface screen displayed on the display device, graphical elements for selection of a prompting interface for capture of images of damage to the vehicle;

receiving selection of a graphical element corresponding to a prompting interface;

displaying one or more prompts on the display device to capture a portion of the vehicle based on the selection of the graphical element corresponding to the prompting interface;

causing the camera of the client device to capture an image of the vehicle based on displaying an outline of the portion of the vehicle; and

causing the image of the vehicle to be uploaded to a server for estimation of repair costs of the vehicle based on the image.

10. The method of claim 9, wherein the prompting interface comprises a prompting interface based on a three-dimensional (3D) model of the vehicle, and the method further comprises:

displaying a 3D model of the vehicle;

receiving a selection of a damaged part on the 3D model; and

displaying an outline of the selected part to be

10. The method of claim 9, wherein the prompting interface comprises a prompting interface based on a three-dimensional (3D) model of the vehicle, and the method further comprises:

displaying a 3D model of the vehicle;

receiving a selection of a damaged part on the 3D model; and

displaying an outline of the selected part to be captured with the camera of the client device.

11. The method of claim 9, wherein the prompting interface comprises a prompting interface based on a parts list of the vehicle, and the method further comprises:

displaying a parts list;

receiving a selection of a part from the parts list; and

displaying an outline of the part to be captured with the camera of the client device.

12. The method of claim 9, wherein the prompting interface comprises a prompting interface based on vehicle views, and the method further comprises:

displaying two or more vehicle views; and

for each of the two or more vehicle views, displaying an outline of the view of the vehicle to be captured with the camera of the client device.

13. The method of claim 9, wherein the mobile device is operated by an owner or driver of the vehicle.

14. The method of claim 9, wherein the mobile device is operated by an insurance adjuster.

15. The method of claim 9, wherein the mobile device is operated by an employee of an auto repair shop.