CLAIMS

1. An object profiling system comprising:

a visible spectrum camera;

a thermal camera, wherein the visible light spectrum camera and the thermal camera are disposed to capture a common zone; and

a processor configured to:

receive a stream of visible spectrum images and thermal images of the common zone, taken respectively by the visible spectrum camera and the thermal camera, when an object is detected to pass through the common zone; and

isolate the object in the visible spectrum images through cross reference against co-ordinates of its thermal silhouette found in the thermal images.

2. The object profiling system of claim 1, wherein in isolating the object in the visible spectrum images, the processor is configured to

locate co-ordinates of a region within the thermal images having a thermal silhouette of different intensity from its surroundings;

identify corresponding co-ordinates within the visible spectrum images, the corresponding co-ordinates obtained by translating the co-ordinates of the thermal silhouette in the thermal images; and

demarcate a region defined by the corresponding co-ordinates as the object in the visible spectrum images.

3. The object profiling system of claim 1 or 2, wherein the processor is further configured to

correct for clock offset between the thermal camera and the visible spectrum camera when selecting the thermal images and the visible spectrum images of the common zone to perform the isolation of the object.

4. The object profiling system of any one of the preceding claims, wherein the processor is further configured to

extract a boundary containing the isolated object; and

transmit image content within the extracted boundary to a classifier to identify the object.

5. The object profiling system of any one of the claims 1 to 3, wherein the processor is further configured to

extract a boundary containing the isolated object for each of the visible spectrum images; and wherein the object profiling system further comprises a classifier configured to

compute label probabilities for each of the extracted boundaries; and

identify the object from a label with the highest probability from the computed label probabilities.

6. The object profiling system of claim 5, wherein the processor is further configured to

isolate the object in the visible spectrum images through detection of its motion; and

transmit image content within an extracted boundary containing the object isolated through motion detection to the classifier,

wherein the classifier is further configured to

reject the image content from the extracted boundary resulting from the object isolation through its thermal silhouette and the image content from the extracted boundary resulting from the object isolation through its motion detection, both of null class; and

identify the object from a label with highest probability for the image contents of the remaining extracted boundaries.

7. The object profiling system of any one of the claims 4 to 6, further comprising

a display, wherein the processor is further configured to

receive the identity of the object from the classifier; and

show the identity of the object in the display.

8. The object profiling system of any one of the preceding claims, wherein the processor is further configured to

distinguish an occupied portion of the thermal silhouette from an empty portion of the thermal silhouette, based on a detected temperature difference between the occupied portion and the empty portion; and

estimate a percentage of content remaining in the object by comparing the occupied portion against a sum of the occupied and empty portions.

9. The object profiling system of claim 7, wherein the processor is further configured to distinguish the occupied portion from the empty portion by identifying which has a temperature closer to that of ambient temperature.

10. The object profiling system of claim 8 or 9, wherein the processor is further configured to

construct a contour of the object from the occupied and empty portions of the thermal silhouette.

11. The object profiling system of claim 10, wherein the processor is further configured to

recognise one or more portions of the thermal silhouette attributable to occlusions, based on determining a difference between a size of the thermal silhouette in a thermal image and a thermal image with the biggest thermal silhouette;

populate the occluded portions using interpolation to fit the constructed contour of the object; and

confer onto the populated portion a thermal profile that corresponds with its surroundings.

12. The object profiling system of any one of the claims 9 to 11, wherein the processor is further configured to discard thermal images where the constructed contour intersects with a boundary of the thermal silhouette.

13. The object profiling system of any one of the preceding claims, wherein the object comprises a container for holding dispensable content.

14. The object profiling system of any one of the preceding claims, further comprising

a temperature regulated enclosure with a door, wherein the common zone is located proximate to a space occupied by the door when closed; and wherein the processor is further configured to

trigger the visible spectrum camera and the thermal camera to take images of the common zone when the door is detected to be opened.

15. The object profiling system of claim 14, wherein the temperature regulated enclosure is a cooled environment or a heated environment.

16. An object profiling system comprising

a thermal camera disposed to capture a zone; and

a processor configured to:

receive a stream of thermal images of the zone taken by the thermal camera when an object is detected to pass through the zone; and

determine a percentage of content remaining in the object based on a detected temperature difference between its occupied portion and its empty portion through analysis of a thermal silhouette of the object in the thermal images.

17. The object profiling system of claim 16, wherein the processor is further configured to distinguish the occupied portion from the empty portion by identifying which has a temperature closer to that of ambient temperature.

18. The object profiling system of claim 16 or 17, wherein the processor is further configured to construct a contour of the object from the occupied and empty portions of the thermal silhouette.

19. The object profiling system of claim 18, wherein the processor is further configured to recognise one or more portions of the thermal silhouette attributable to occlusions, based on determining a difference between a size of the thermal silhouette in a thermal image and a thermal image with the biggest thermal silhouette;

populate the occluded portions using interpolation to fit the constructed contour of the object; and

confer onto the populated portion a thermal profile that corresponds with its surroundings.

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a thermal camera, wherein the visible light spectrum camera and the thermal camera are disposed to capture a common zone; and

a processor configured to:

receive a stream of visible spectrum images and thermal images of the common zone, taken respectively by the visible spectrum camera and the thermal camera, when an object is detected to pass through the common zone; and

isolate the object in the visible spectrum images through cross reference against co-ordinates of its thermal silhouette found in the thermal images, the thermal silhouette being due to the temperature of the isolated object being different from ambient temperature.

2. The object profiling system of claim 1, wherein in isolating the object in the visible spectrum images, the processor is configured to

locate co-ordinates of a region within the thermal images having a thermal silhouette of different intensity from its surroundings;

identify corresponding co-ordinates within the visible spectrum images, the corresponding co-ordinates obtained by translating the co-ordinates of the thermal silhouette in the thermal images; and

demarcate a region defined by the corresponding co-ordinates as the object in the visible spectrum images.

3. The object profiling system of claim 1 or 2, wherein the processor is further configured to

correct for clock offset between the thermal camera and the visible spectrum camera when selecting the thermal images and the visible spectrum images of the common zone to perform the isolation of the object.

4. The object profiling system of any one of the preceding claims, wherein the processor is further configured to

extract a boundary containing the isolated object; and

transmit image content within the extracted boundary to a classifier to identify the object.

5. The object profiling system of any one of the claims 1 to 3, wherein the processor is further configured to

extract a boundary containing the isolated object for each of the visible spectrum images; and

wherein the object profiling system further comprises a classifier configured to

compute label probabilities for each of the extracted boundaries; and

identify the object from a label with the highest probability from the computed label probabilities.

6. The object profiling system of claim 5, wherein the processor is further configured to

isolate the object in the visible spectrum images through detection of its motion; and

transmit image content within an extracted boundary containing the object isolated through motion detection to the classifier,

wherein the classifier is further configured to

reject the image content from the extracted boundary resulting from the object isolation through its thermal silhouette and the image content from the extracted boundary resulting from the object isolation through its motion detection, both of null class; and

identify the object from a label with highest probability for the image contents of the remaining extracted boundaries.

7. The object profiling system of any one of the claims 4 to 6, further comprising

a display, wherein the processor is further configured to

receive the identity of the object from the classifier; and

show the identity of the object in the display.

8. The object profiling system of any one of the preceding claims, wherein the processor is further configured to

distinguish an occupied portion of the thermal silhouette from an empty portion of the thermal silhouette, based on a detected temperature difference between the occupied portion and the empty portion; and

estimate a percentage of content remaining in the object by comparing the occupied portion against a sum of the occupied and empty portions.

9. The object profiling system of claim 7, wherein the processor is further configured to distinguish the occupied portion from the empty portion by identifying which has a temperature closer to that of ambient temperature.

10. The object profiling system of claim 8 or 9, wherein the processor is further configured to

construct a contour of the object from the occupied and empty portions of the thermal silhouette.

11. The object profiling system of claim 10, wherein the processor is further configured to

recognise one or more portions of the thermal silhouette attributable to occlusions, based on determining a difference between a size of the thermal silhouette in a thermal image and a thermal image with the biggest thermal silhouette;

populate the occluded portions using interpolation to fit the constructed contour of the object; and

confer onto the populated portion a thermal profile that corresponds with its surroundings.

12. The object profiling system of any one of the claims 9 to 11, wherein the processor is further configured to discard thermal images where the constructed contour intersects with a boundary of the thermal silhouette.

13. The object profiling system of any one of the preceding claims, wherein the object comprises a container for holding dispensable content.

14. The object profiling system of any one of the preceding claims, further comprising

a temperature regulated enclosure with a door, wherein the common zone is located proximate to a space occupied by the door when closed; and wherein the processor is further configured to

trigger the visible spectrum camera and the thermal camera to take images of the common zone when the door is detected to be opened.

15. The object profiling system of claim 14, wherein the temperature regulated enclosure is a cooled environment or a heated environment.

16. An object profiling system comprising

a thermal camera disposed to capture a zone; and

a processor configured to:

receive a stream of thermal images of the zone taken by the thermal camera when an object is detected to pass through the zone;

determine a percentage of content remaining in the object based on a detected temperature difference between its occupied portion and its empty portion through analysis of a thermal silhouette of the object in the thermal images;

construct a contour of the object from the occupied and empty portions of the thermal silhouette;

recognise one or more portions of the thermal silhouette attributable to occlusions, based on determining a difference between a size of the thermal silhouette in a thermal image and a thermal image with the biggest thermal silhouette;

populate the occluded portions using interpolation to fit the constructed contour of the object; and

confer onto the populated portion a thermal profile that corresponds with its surroundings.

17. The object profiling system of claim 16, wherein the processor is further configured to distinguish the occupied portion from the empty portion by identifying which has a temperature closer to that of ambient temperature.