CLAIMS

1. A method to identify an object comprising:

receiving an image, the image having an object in front of a background;

segmenting the image into a segmented image using a segmentation technique, the segmented image having a foreground component showing at least a part of the object and a background component showing at least a part of the background;

determining at least one property of the foreground component of the segmented image; and

matching the at least one property of the foreground component with a database of identified objects having the corresponding at least one property to identify the object.

2. A method to identify an object according to claim 1 further comprising:

segmenting the image using further segmentation techniques into further segmented images to produce a plurality of segmented images; and choosing one or more segmented images from the plurality of segmented images for determining the at least one property of the foreground component.

3. A method to identify an object according to claim 2 wherein choosing the one or more segmented image from the plurality of segmented images comprises:

determining a center point of the foreground component in each segmented image;

calculating a coefficient of variation for each segmented image based on the distance of pixels belonging to the foreground component from the center point of the foreground component in the segmented image; and

determining whether the coefficient of variation of each segmented image falls below a predetermined value.

4. A method to identify an object according to claim 2 wherein choosing the one or more segmented image from the plurality of segmented images comprises:

determining number of pixels belonging to the foreground component in each segmented image; and

determining whether the number of pixels belonging to the foreground component in each segmented image falls within a predetermined range of values.

5. A method to identify an object according to any of the claims 1 to 4 wherein segmenting the image using the segmentation technique or techniques comprises:

determining a number of colour categories in the image;

grouping each pixel of the image under one of the number of colour categories based on similarities of colour of each pixel to colour of the colour categories ; and

determining the foreground component and the background component of the image based on the grouped pixels.

6. A method to identify an object according to claim 5 wherein segmenting the image using the segmentation technique or techniques further comprises:

determining a center point of the image;

calculating distance of each pixel from the center points of the image; and

grouping each pixel in the image under one of the number of colour categories further based on the distance of the pixel from the center points of the image.

7. A method to identify an object according to claims 5 or 6 wherein segmenting the image using the segmentation technique or techniques further comprises:

performing colour conversion on each pixel to increase algorithm efficacy before determining the number of colour categories in the image comprising:

assigning hue, saturation, and lightness for each pixel in hue, saturation, and lightness (HSL) colour space;

equating value to the lightness for each pixel such that hue, saturation, and value (HSV) colour space is defined for each pixel; and

transforming hue, saturation, and value (HSV) colour space to red, green, blue (RGB) colour space for each pixel.

8. A method to identify an object according to any of the claims 1 to 4 wherein segmenting the image using the segmentation technique or techniques comprises:

identifying a range of colours such that pixels having the range of colours are grouped as the background component of the segmented image; and

grouping pixels not having the range of colours as the foreground component of the segmented image.

9. A method to identify an object according to any of the preceding claims wherein determining the at least one property of the foreground component includes identifying a contour of the foreground component.

10. A method to identify an object according to claim 9 wherein determining the at least one property of the foreground component further comprises:

identifying a minimum area bounding the contour of the foreground component in the form of a bounding box; and

identifying at least one critical feature of the bounding box;

wherein the at least one property of the foreground component includes the at least one critical feature.

11. A method to identify an object according to claim 9 or 10 wherein determining the at least one property of the foreground component further comprises:

identifying a plurality of points along the contour of the foreground component; and

selecting a shape out a plurality of predefined shapes based on the plurality of points;

wherein the at least one property of the foreground component includes the shape selected based on the plurality of points.

12. A method to identify an object according to claim 11 wherein determining the at least one property of the foreground component further comprises:

reducing the plurality of points identified comprising:

selecting a point;

identifying a first neighboring point nearest the selected point;

identifying a second neighboring point the second next nearest the selected point;

determining an angle between a first line drawn between the selected point and the first neighboring point and a second line drawn between the selected point and the second neighbouring point; and

removing the selected point if the angle exceeds a predetermined value.

13. A method to identify an object according to claim 11 or 12 wherein determining the at least one property of the foreground component further comprises:

reducing the plurality of points identified comprising:

selecting a first point;

selecting a second point;

identifying a bounding box such that the first point falls on a first corner of the bounding box and the second point falls on a second corner of the bounding box diagonally opposite the bounding box from the first corner, the bounding box having a width and a height;

determining a threshold of the bounding box based on the width and the height; and

removing the second point if the threshold falls below a predetermined value.

14. A method to identify an object according to any of claims 11 to 13 wherein matching the at least one property of the foreground component comprises:

rating similarity between the shape of the foreground component based on the plurality of points and an identified object in the database comprising:

forming a first polygon having a first number of vertices formed from the shape of the foreground component and a second polygon having a second number of vertices derived from the identified object in the database;

determining whether the first number of vertices is equal to the second number of vertices;

removing a vertice from the polygon having a greater number of vertices and changing an index if the first number of vertices is not equal to the second number of vertices;

reiterating comparison between the polygonal with reduced vertice and the remaining polygonal and changing the index until the first number of vertices is equal to the second number of vertices;

determining whether the first polygon is similar to the second polygon if the first number of vertices is equal to the second number of vertices;

removing a vertice from both the first polygon and the second polygon and changing the index if the first polygon is not similar to the second polygon but the first number of vertices is equal to the second number of vertices;

assigning the index to the identified object if the first polygon is similar to the second polygon and the first number of vertices is equal to the second number of vertices; and

reiterating comparison between polygonals with removed vertices and changing the index until the index is assigned;

wherein the index indicates similarity between the shape of the foreground component and the identified objects;

repeating rating similarity between the shape of the foreground component and subsequent identified objects in the database; and

matching the foreground component to the identified object in the database having the highest index.

15. A method to identify an object according to any of claims 1 to 8 wherein determining the at least one property of the foreground component includes identifying a colour scheme of the foreground component, the colour scheme comprising at least one colour.

16. A method to identify an object according to claim 15 wherein determining the colour scheme of the foreground component includes categorizing the at least one colour in one of the plurality of predetermined bins of quantized colours.

17. A method to identify an object according to 16 wherein identifying the colour scheme of the foreground component includes removing noise from the foreground component prior to categorizing the at least one colour in one of the plurality of predetermined bins of quantized colours.

18. A method to identify an object according to any of the preceding claims wherein the segmented image is a binary image having a first colour and a second colour, the first colour for identifying the foreground component and the second colour for identifying the background component.

19. A method to identify an object according to any of the preceding claims wherein the object is a pill.

20. A system for identifying an object comprising:

an image receiver to receive an image, the image having the object in front of a background;

a segmentor to segment the image into a segmented image using a segmentation technique, the segmented image having a foreground component showing at least a part of the object and a background component showing at least a part of the background;

a determinor to determine at least one property of the foreground component of the segmented image; and

a matcher to match the at least one property of the foreground component with a database of identified objects having the corresponding at least one property to identify the object

21. A system for identifying an object according to claim 20 wherein the system comprises a single device.

22. A system for identifying an object according to claim 21 wherein the device is mobile device.

CLAIMS

1. A method to identify an object comprising:

receiving an image, the image having an object in front of a background;

segmenting the image into a segmented image using a segmentation technique, the segmented image having a foreground component showing at least a part of the object and a background component showing at least a part of the background;

determining at least one property of the foreground component of the segmented image;

matching the at least one property of the foreground component with a database of identified objects having the corresponding at least one property to identify the object; and

segmenting the image using further segmentation techniques into further segmented images to produce a plurality of segmented images; and choosing one or more segmented images from the plurality of segmented images for determining the at least one property of the foreground component;

wherein choosing the one or more segmented image from the plurality of segmented images comprises:

determining a center point of the foreground component in each segmented image;

calculating a coefficient of variation for each segmented image based on the distance of pixels belonging to the foreground component from the center point of the foreground component in the segmented image; and

determining whether the coefficient of variation of each segmented image falls below a predetermined value.

2. A method to identify an object according to claim 1, wherein segmenting the image using the segmentation technique or techniques comprises:

determining a number of colour categories in the image;

grouping each pixel of the image under one of the number of colour categories based on similarities of colour of each pixel to colour of the colour categories ; and

determining the foreground component and the background component of the image based on the grouped pixels.

3. A method to identify an object according to claim 2, wherein segmenting the image using the segmentation technique or techniques further comprises:

determining a center point of the image;

calculating distance of each pixel from the center points of the image; and

grouping each pixel in the image under one of the number of colour categories further based on the distance of the pixel from the center points of the image.

4. A method to identify an object according to claims 2 or 3 wherein segmenting the image using the segmentation technique or techniques further comprises:

performing colour conversion on each pixel to increase algorithm efficacy before determining the number of colour categories in the image comprising:

assigning hue, saturation, and lightness for each pixel in hue, saturation, and lightness (HSL) colour space;

equating value to the lightness for each pixel such that hue, saturation, and value (HSV) colour space is defined for each pixel; and

transforming hue, saturation, and value (HSV) colour space to red, green, blue (RGB) colour space for each pixel.

5. A method to identify an object according to claim 1 wherein segmenting the image using the segmentation technique or techniques comprises:

identifying a range of colours such that pixels having the range of colours are grouped as the background component of the segmented image; and

grouping pixels not having the range of colours as the foreground component of the segmented image.

6. A method to identify an object according to any of the preceding claims wherein determining the at least one property of the foreground component includes identifying a contour of the foreground component.

7. A method to identify an object according to claim 6 wherein determining the at least one property of the foreground component further comprises:

identifying a minimum area bounding the contour of the foreground component in the form of a bounding box; and

identifying at least one critical feature of the bounding box;

wherein the at least one property of the foreground component includes the at least one critical feature.

8. A method to identify an object according to claim 6 or 7 wherein determining the at least one property of the foreground component further comprises:

identifying a plurality of points along the contour of the foreground component; and

selecting a shape out a plurality of predefined shapes based on the plurality of points;

wherein the at least one property of the foreground component includes the shape selected based on the plurality of points.

9. A method to identify an object according to claim 8 wherein determining the at least one property of the foreground component further comprises:

reducing the plurality of points identified comprising:

selecting a point;

identifying a first neighboring point nearest the selected point;

identifying a second neighboring point the second next nearest the selected point;

determining an angle between a first line drawn between the selected point and the first neighboring point and a second line drawn between the selected point and the second neighbouring point; and

removing the selected point if the angle exceeds a predetermined value.

10. A method to identify an object according to claim 8 or 9 wherein determining the at least one property of the foreground component further comprises:

reducing the plurality of points identified comprising:

selecting a first point;

selecting a second point;

identifying a bounding box such that the first point falls on a first corner of the bounding box and the second point falls on a second corner of the bounding box diagonally opposite the bounding box from the first corner, the bounding box having a width and a height;

determining a threshold of the bounding box based on the width and the height; and

removing the second point if the threshold falls below a predetermined value.

11. A method to identify an object according to any of claims 8 to 10 wherein matching the at least one property of the foreground component comprises:

rating similarity between the shape of the foreground component based on the plurality of points and an identified object in the database comprising:

forming a first polygon having a first number of vertices formed from the shape of the foreground component and a second polygon having a second number of vertices derived from the identified object in the database;

determining whether the first number of vertices is equal to the second number of vertices;

removing a vertice from the polygon having a greater number of vertices and changing an index if the first number of vertices is not equal to the second number of vertices;

reiterating comparison between the polygonal with reduced vertice and the remaining polygonal and changing the index until the first number of vertices is equal to the second number of vertices;

determining whether the first polygon is similar to the second polygon if the first number of vertices is equal to the second number of vertices;

removing a vertice from both the first polygon and the second polygon and changing the index if the first polygon is not similar to the second polygon but the first number of vertices is equal to the second number of vertices;

assigning the index to the identified object if the first polygon is similar to the second polygon and the first number of vertices is equal to the second number of vertices; and

reiterating comparison between polygonals with removed vertices and changing the index until the index is assigned;

wherein the index indicates similarity between the shape of the foreground component and the identified objects;

repeating rating similarity between the shape of the foreground component and subsequent identified objects in the database; and

matching the foreground component to the identified object in the database having the highest index.

12. A method to identify an object according to any of claims 1 to 5 wherein determining the at least one property of the foreground component includes identifying a colour scheme of the foreground component, the colour scheme comprising at least one colour.

13. A method to identify an object according to claim 12 wherein determining the colour scheme of the foreground component includes categorizing the at least one colour in one of the plurality of predetermined bins of quantized colours.

14. A method to identify an object according to claim 13 wherein identifying the colour scheme of the foreground component includes removing noise from the foreground component prior to categorizing the at least one colour in one of the plurality of predetermined bins of quantized colours.

15. A method to identify an object according to any of the preceding claims wherein the

segmented image is a binary image having a first colour and a second colour, the first colour for identifying the foreground component and the second colour for identifying the background component.

16. A method to identify an object according to any of the preceding claims wherein the object is a pill.