having color histogram data within a predetermined color range, and also having gray levels within a predetermined gray level range, are identified as border sections and recorded onto the banknote boundary map. The predetermined color range is based on color histogram data for a border of a valid monetary banknote, while the predetermined gray level range is based on gray levels for a border of a valid monetary banknote. Therefore, as the predetermined ranges above are specifically tuned according to border information of a valid banknote, this step appropriately selects border sections using the correct criteria. This step is further illustrated in FIG. **8**, showing an original image **810**, and image sections meeting the criteria above selected as the border sections in the banknote boundary map **830**.

[0066] Typically, a border of a monetary banknote is unique from the main body and is more transparent, resulting in different gray level and color histogram data than the main body. It is these properties that are exploited in order to properly determine corresponding border sections in the banknote boundary map **830**.

[0067] Banknote Main Body Block Removal **460**

[0068] With border sections identified in the banknote boundary map, the next step comprises banknote main body block removal **460**. Note from FIG. **8**, upon generating the banknote boundary map **830**, the border sections comprise internal border sections enclosed by perimeter border sections. The internal border sections exist because, although the predetermined color and gray level ranges are tuned according to a valid banknote boundary, there may also be main body sections within the banknote that also meet the banknote boundary criteria. As the internal border sections are not required, they are removed accordingly. FIG. **9** illustrates this step, showing an original banknote boundary map **910**, followed by the removal of internal border sections in **920** resulting in only the perimeter border sections in of the banknote boundary map.

[0069] Removal of the internal border sections enclosed by perimeter border sections can be conducted according to a number of criteria. In a preferred embodiment, the method can remove a number of internal border sections according to number of sections being greater than a threshold number. Additional embodiments may utilize removing internal border sections in the banknote boundary map such that the removed internal border sections correspond to a predetermined surface area.

[0070] Banknote Boundary Dilation **470**

[0071] The final step of banknote boundary map generation in this embodiment involves banknote boundary dilation **470**. This step is also illustrated in FIG. **9** through banknote boundary dilation **930**. This step is included because certain portions of the perimeter border sections may be very thin and not entirely connected by neighboring border sections. This characteristic may make it very difficult to distinguish the border of a certain banknote from surrounding or overlapping ones. Therefore, the perimeter border sections on the banknote boundary map are dilated to provide further clarity and resolution between banknotes.

[0072] Although an embodiment for generating the banknote boundary map is discussed above, other embodiments may be equally applicable in achieving the goals of the present invention. Therefore, the exact implementation for discerning the border sections from the original scanned image can vary according to a number of embodiments. Other embodiments may involve comparing color histogram data of image sections of the scanned image to color histogram data corresponding to boundaries of valid monetary banknotes. Another embodiment may involve comparing texture data of the image sections to texture data corresponding to boundaries of valid monetary banknotes. The exact implementation of the banknote boundary map is intermediate, as long as the banknote boundary map suffices in identifying border sections from the image sections corresponding to a boundary of monetary banknotes within the scanned image.

[0073] In some embodiments, banknote Boundary Map Generation **120** may further include a binary decision map generation **430** step briefly referred to above in FIG. **4**. In this case a color binary decision map indicating probable sections corresponding to the monetary banknotes are generated. Border sections are then recorded onto the banknote boundary map as the probable sections having color histogram data within the predetermined color range and gray levels within the predetermined gray level range. This embodiment therefore adds an extra processing step for more refined verification results. Further details are described below.

[0074] Binary Decision Map Generation **430**

[0075] Binary decision map generation **430** focuses on generation of the color binary decision map. The color binary decision map indicates probable sections from the sections in the image corresponding to the monetary banknote based on color histogram data. An example of this is shown in FIG. **10**. The left hand image of FIG. **10** shows an original image containing a monetary banknote, while the right hand section illustrates the color binary decision map. The probable sections corresponding to the monetary banknote from the image are shown in black. Determination of the probable sections in the color binary decision map is in accordance to a frequency of occurrence of the color histogram data within a valid monetary banknote. For instance, color histogram data is extracted from sections of the image. This histogram data is compared to color histogram data within a valid monetary banknote. Based on a frequency of occurrence within the valid monetary banknote, the section is a probable section if it exceeds a predetermined statistical threshold.

[0076] An embodiment describing the method for Binary decision map generation **430** of FIG. **4** is outlined in FIG. **11** through process **1100**. Each step of process **1100** is described in the following:

[0077] As illustrated in FIG. **11**, the first step of Binary decision map generation **430** comprises dividing the scanned image is into a plurality of decision sections **1110**, which will each be analyzed. This can be performed in a manner similar to FIG. **2** and FIG. **3** as shown for the verification sections, and therefore does not require further discussion. In certain embodiments, the decision sections may also correspond to the verification sections. Dividing the image into decision sections allows for lower computational costs in determining valid and invalid sections of the image in terms of color characteristics.

[0078] Once divided into decision sections, color histogram data is then extracted for each decision section **1120**. This step is performed similar to that shown in FIG. **5** and FIG. **6**, and is therefore not discussed in any further detail for brevity. The preferred embodiment employs a three dimensional color space, such as an RGB color space, having a