

indices arranged in regions, detecting curves and corners from the regions of the indices, and matching detected curves and corners of regions of the generated indices with curves and corners of regions of the prestored indices.

FIG. 6 shows a system where infrared energy rays 601 impact surface 10. The absorption and conduction of these rays by surface 10 is calculated in the manner previously described and stored in a memory 61. Sensor 60 receives the image which is presented to processor 62 and memory 61 via bus 63 to determine a proper match. In this example, the absorptivity and conductivity of the received infrared image would be derived as discussed above using processor 62 and comparison with prestored models in memory 61 would be made.

Note that the preferred embodiment of the present invention does not depend on the type of surface being studied. Thus, the present invention has application across all sorts of sensor data surfaces and can be used for any surface or terrain. Also note that the embodiment shows a processor and memory for performing the various functions, but a specific circuit could be designed by those skilled in the art to perform one or all of the steps of the method.

An additional use of absorptivity and conductivity values computed from infrared imagery is discussed here. These values are computed from an image, of say a particular region of interest, acquired at a particular time of day or night. They can then be used to simulate an image of the same region at any other specified time of day or night. This is done by substituting the computed absorptivity and conductivity values in the heat balance equation (equation (6)) for various values of $f(t)$, the time dependent term representing the temporal variation in the image content. The ambient temperature term in the same equation can be varied to simulate different levels of ambient temperature (for say summer and winter days). Such image simulation is useful in training programs in the operation and image interpretation of infrared imaging systems.

Although this description describes the invention with reference to the above specified embodiments, the claims and not this description limit the scope of the invention. Various modifications of the disclosed embodiment, as well as alternative embodiments of the invention, will become apparent to persons skilled in the art upon reference to the above description. Therefore, the appended claims will cover such modifications that fall within the true scope of the invention.

What is claimed is:

1. The method of generating indices of a surface for storage in a data base, said method comprising the steps of:

- receiving a single image of a surface;
- generating a heat balance equation of said surface from said single image;
- solving said equation from said single image to obtain the heat absorptivity and conductivity of said surface; and
- establishing indices of said surface for storage in a data base based on the heat absorptivity and conductivity obtained from said step of solving.

2. The method set forth in claim 1 further comprising the steps of:

- obtaining a single new image of a surface;
- generating a heat balance equation of said surface from said single new image;

solving said new image equation to obtain heat absorptivity and conductivity of said new image to establish indices of said new image;

comparing said new image indices to indices stored in said data base; and

generating a probable match between previous stored surface indices and said indices of said new image.

3. The method set forth in claim 2 wherein the indices for a given surface area, whether stored in said data base or generated from said new image, are broken into regions, and wherein the method further includes the step of:

comparing individual index regions of a new surface against similar individual stored index regions.

4. The method set forth in claim 3 wherein said index regions contain curves and corners, and wherein the method further includes the step of:

detecting the curves and corners of the index regions of said new image; and

matching said detected curves and corners against curves and corners of said stored index regions.

5. The method set forth in claim 1 wherein said single image is obtained at a first point in time, said method further comprising the step of:

generating from said established indices for a surface synthetic images of said surface representing said surface at a second point in time.

6. A circuit for generating indices of a surface for storage in a data base, said circuit comprising:

- circuitry for receiving an image of a surface;
- circuitry for generating a heat balance equation of said surface from said single image;
- circuitry for solving said equation from said single image to obtain the heat absorptivity and conductivity of said surface; and

circuitry for establishing indices of said surface for storage in a data base based on the heat absorptivity and conductivity obtained from said circuitry for solving.

7. The method set forth in claim 6 further comprising the steps of:

circuitry for obtaining a single new image of a surface;

circuitry for generating a heat balance equation of said surface from said single new image;

circuitry for solving said new image equation to obtain heat absorptivity and conductivity of said new image to establish indices of said new image;

circuitry for comparing said new image indices to indices stored in said data base; and

circuitry for generating a probable match between previous stored surface indices and said indices of said new image.

8. The method set forth in claim 7 wherein the indices for a given surface area, whether stored in said data base or generated from said new image, are broken into regions, and wherein the method further includes the step of:

circuitry for comparing individual index regions of a new surface against similar individual stored index regions.

9. The method set forth in claim 8 wherein said index regions contain curves and corners, and wherein the method further includes the step of:

circuitry for detecting the curves and corners of the index regions of said new image; and