to the normal **1735** of the surface **1736** of the object (the normal vector is shown for clarity pointing inward to the object).

The difference in direction can be calculated by using the TV camera (which could be a stereo pair for greater angular resolution) as well to determine the surface normal direction. This can, for example, be done by placing a target set such as **1740** on the surface in the field of the camera as shown. This can be dynamically or statically accomplished using the photogrammetric method described in the Pinkney references.

Differences in direction between the surface normal and the transducer pointing direction are then utilized by software in the computer **1725** of the invention in analysis of the ultrasound signals detected. The pointing angle and the position of the transducer on the surface of the object are used by the computer in predicting the location of various returns from internal points within the object, using a suitable coordinate transformation to relate them to the external coordinate reference of the TV camera.

All data, including transducer signals and wand location is fed to computer **1725** which then allows the 3D image of the inside of the body to be determined as the wand is moved around, by a human, or by a robot. This is really neat as all the images sequentially obtained in this manner can be combined in the computer to give an accurate 3D picture **1745** displayed on monitor **1750**.

In one preferred embodiment as shown in FIG. **17**C, the transducer head **1700** is comprised of a matrix **1755** of 72 individual transducer elements which send and receive ultrasound data at for example, 5 MHZ. This allows an expanded scan capability, since the sensor can be held steady at each discrete location xyz on the object surface, and a 3D image obtained with out movement of the transducer head, by analyzing the outputs of each of the transducers. Some earlier examples are described in articles such as: Richard E. Davidsen, 1996 IEEE Ultrasonics Symposium, A Multiplexed Two-Dimensional Array For Real Time Volumetric and B-Mode; Stephen W. Smith, 1995 IEEE Ultrasonics Symposium, Update On 2-D Array Transducers For Medical Ultrasound, 1995.

If the wand is now moved in space, fine scan resolution is obtained, due to the operation of the individual elements so positioned with out the need to move the wand in a fine pitch manner to all points needed for spatial resolution of this order. This eases the operators task, if manually performed, and makes robotization of such examination much easier from a control point of view.

Consider FIG. **17**B which illustrates a transducer as just described, also with automatic compensation at each point for pointing angle, robotically positioned by robot, **1785** with respect to object **1764**. In this case a projection technique such as described in U.S. Pat. No. 5,854,491 is used to optically determine the attitude of the object surface, and the surface normal direction **1760** from the position of target set **1765** projected on the surface by diode laser set **1770**, and observed by TV Camera **1775** located typically near the working end of the robot. Differences between the normal direction and the transducer propagation direction (typically parallel to the housing of the transducer) is then used by computer **1777** to correct the data of the ultrasonic sensor **1780** whose pointing direction in space is known through the joint angle encoders and associated control system **1782** of robot **1785** holding the sensor. Alternatively the pointing direction of this sensor can be monitored by an external camera such as **1710** of FIG. **17**A.

It should be noted that the data obtained by TV camera **1775** concerning the normal to the surface and the surface range from the robot/ultrasonic sensor, can be used advantageously by the control system **1782** to position the robot and sensor with respect to the surface, in order to provide a fully automatic inspection of object **1764**. Indeed the camera sensor operating in triangulation can be used to establish the coordinates of the exterior surface of object **1764** as taught for example in U.S. Pat. No. 5,854,491, while at the same time, the acoustic sensor can determine the range to interior points which can be differentiated by their return signal time or other means. In this manner, a complete 3D map of the total object, interior and exterior, can be obtained relative to the coordinate system of the Robot, which can then be transformed to any coordinate system desired.

The invention has a myriad of applications beyond those specifically described herein. The games possible with the invention in particular are limited only by the imagination.

What is claimed is:

1. Method of determining the orientation of a handheld electronic device with respect to a video display, comprising the steps of:

providing a TV camera within said handheld device to acquire an image of a plurality of discrete points proximate said video display, said video display being separate from said handheld device;

providing a computer to process images obtained with said TV camera;

obtaining an image of the points with said TV camera;

processing said TV camera image with said computer to determine information concerning said points;

with said determined information, determining the orientation of said handheld device with respect to said video display; and

controlling an image presented on said video display using said determined orientation of the handheld device.

2. A method according to claim **1** further including the step of communicating said orientation to another device.

3. A method according to claim **1**, including the further step of determining the location of said display with respect to said handheld device.

4. A method according to claim **1**, wherein said information includes the location of a plurality of points in said image.

5. A method according to claim **1**, wherein said processing step further includes the step of recognizing at least one of said discrete points by its shape.

6. A method according to claim **1**, wherein said processing step further includes the step of recognizing at least one of said discrete points by its color.

7. A method according to claim **1**, wherein said processing step further includes the step of recognizing at least one of said discrete points by its contrast.

8. A method according to claim **1**, including the further step of identifying a virtual object on said screen being pointed at by a user of said handheld device.

9. A method according to claim **1**, including the further step of determining a motion variable of said handheld device.

10. A method according to claim **1**, further including the step of determining a pointing direction of said handheld device.

11. A method according to claim **8**, wherein said virtual object is a control icon.

12. A method according to claim **1**, wherein said handheld device is one of a cell phone, a computer or a remote control.

13. A method according to claim **1**, wherein said processing is performed in a computer contained within said handheld device.