בחינה במחשבים בהתאם לתקנה 130 לתקנות הפטנטים

פנה אליך לקוח המבקש לרשום פטנט. הלקוח מספר כי כיום יש ביקוש הולך וגדל למצלמות וידאו. הלקוח פיתח מערכת לתצלום תמונות סטילס באיכות גבוהה ע"י מערכת מסתובבת (Rotor). חיבור התמונות של אותה זווית, מאפשר להציג אותם ברצף כוידאו באיכות גבוהה.

הממציא מספק לך את התיאור המצורף.

עליך להכין פירוט מלא בשפה העברית או בשפה האנגלית ,במבנה מוכן להגשה בישראל, כולל שם האמצאה ותביעות.

1. הערות:
2. יש להביא בחשבון את כל הפרטים בנושא המצ"ב ,וההערות הנכללות.
3. במידת הצורך ,ציין איזה מידע חסר לך ,על מנת להשלים את הפירוט.
4. תוכל להיעזר במילונים.

חלוקת הנקודות:

1. תיאור (35)
2. תביעות (40)
3. סגנון ושפה (15)
4. שרטוטים (10)

ציון עובר: 60

בהצלחה!

צוות הבוחנים

ROTARY IMAGE GENERATOR

BACKGROUND

Video cameras are the common tool to use for capturing moving images. A video camera can capture images of the same location over a period of time, when the camera is still. Alternatively, the camera can be moved in a sweeping motion in order to capture images of different areas (an action commonly referred to as "panning"). If the panning motion is too quick or abrupt, the captured images quality frequently degrades and the image becomes blurred or fuzzy.

Certain applications or circumstances such as surveillance cameras or military vehicles require capturing images in real time of the entire surroundings, for example a 360 degrees view, referred to herein as "panoramic view" or "360 degrees view", around the camera location. A single video camera is unable to produce clear images in real time of the entire 360 degrees area surrounding the camera. In order to capture usable video images of 360 degrees and display them (on multiple displays) one would need today multiple, fixed video cameras or omni-directional systems.

SYSTEM OVERVIEW

The present invention describes a rotary image generator, including sensor(s) and lens(es), and a rotating unit that rotates multiple rotation cycles per second (up to 3,600 rotations per second currently). The rotating unit is fast enough to return to the same view direction in order to capture multiple consecutive frames per second.

For example, if a given system can cover 360 degrees, then rotating at 2,400 RPM will produce a total of 2,400 frames per second. Each system can be

programmed to take N pictures to cover the 360 degrees. The consecutive frames may or may not overlap. If they overlap it will usually be by up to 20%.

Now if in this system N=12 (12 frames cover the 360 degrees), then frame 1, 13, 25, 37 etc. will all be of the same direction view. Producing 2,400 frames per second means that for this system each direction view will have 200 frames taken per second.

This set of images of the same view direction can be displayed, for example, as video. In this sense, the rotary image generator takes advantage of the multiple rotation cycles, allowing it to capture enough frames per second to view multiple images and/or videos simultaneously. Each direction view can be displayed as a video, thus producing multiple videos in real-time (up to 12 in the example above).

The invention takes advantage of the multiple rotation cycles, allowing it to capture enough frames per second to get a full 360º view as a moving image, which can be shown as video. It, further, takes advantage of the multiple rotation cycles, allowing it to capture enough frames per second without significant optical distortion, for example, fish eye effect (wide-angle distortion effect), and without blind angles. The invention takes advantage of the multiple rotation cycles allowing it to capture enough frames per second in which each image overlaps, partly or entirely, with another image, or series of images to view super resolution. It also takes advantage of the multiple rotation cycles allowing it to capture enough frames per second to process them into stereoscopic images, which allows the creation three-dimensional views in real-time. A specialized algorithm enables users to select the section of interest out of the 360º view for the system to display. The algorithm runs either on the rotating unit or on the receiving station – according to the system and application.

The invention can be integrated and/or used with any mobile object, stationary object or vehicle, which is on the ground and/or underground and/or in the air and/or in water and/or underwater and/or in space.

Another advantage of the system is that it enables to zoom in a video image in real-time and obtain a quality display, since each frame is a high-resolution image and thus unlike compression type video formats (MPEG etc.), there is no loss of information when zooming in (depending on the image resolution).

FIGURES

Fig. 1 showing a block diagram with the major components of a rotary system, according to some embodiments. A camera **10** comprising an image sensor **100**, an image sensor engine **110**, and lens **40** is driven (controlled) by a controller unit **130** and a signal trigger unit **120**. The image sensor engine **110** (AKA image processing engine or image processor) operates the image sensor **100** in order to capture an image.

The camera **10** is rotated around its axis by a rotary **20**. The rotary **20** typically comprises a rotation motor or other rotation mechanisms (like air or fluids based rotaries) available in the industry.

The display unit **160** is in charge for processing and displaying in real time the captured images. The captured images are held in an image buffer **180** shown here to reside in the display unit **160** though the image buffer **180** can reside in other locations such as the camera **10**. The display unit **160** comprises an image processing unit **170** and algorithms **200** in order to process and display the captured images. Such processing can be, for example, displaying images according to a specific order, removing overlapping zone between two images, zooming on an image, streaming an array of still images as moving images view (seen by the user as a video) etc. A data exchange interface unit **190** enables the system to communicate with third party system, for example, in order to send the moving images for display on third party display units.

Optionally, one or more permanent storage units **140** can be connected to the system in order to record (save) the captured images. All components receive power from a power supply **150** that can be internal (like batteries) or external (external electricity source) or both. The power transmission unit **90** is connected to the power supply **150** and is responsible for transferring power to the different components of the system and in particular to the rotating components (where a cable cannot be used). The data transmission unit **80** is also connected to the power supply **150** in most cases.

Fig. 2 shows the images captured in a system configured to capture 100 images per second at 600 rpm. We obtain a stream of pictures which can then be processed by the display unit. **Fig. 2** shows how ten images per rotation are generated for viewing up to ten field views simultaneously. After one second, the rotary system has completed ten rotations and shot 100 images.

Every line in **Fig. 2** marked "1. rotation" to "10. rotation" contains the 10 images captured in that rotation. Every images is captured with a different view angle. It is best that every images overlaps with the preceding and following images in order to be able to generate a panoramic view of that rotation. The overlap can be very small, for example, about 5% or less of each images.

Each row in **Fig. 2** contains all the images captured with the same view angle (the 10^{th} row is marked "field view"). When the images in a row are displayed continuously (in this example in a display rate of 10 frames per second), they create a moving images view the scene.

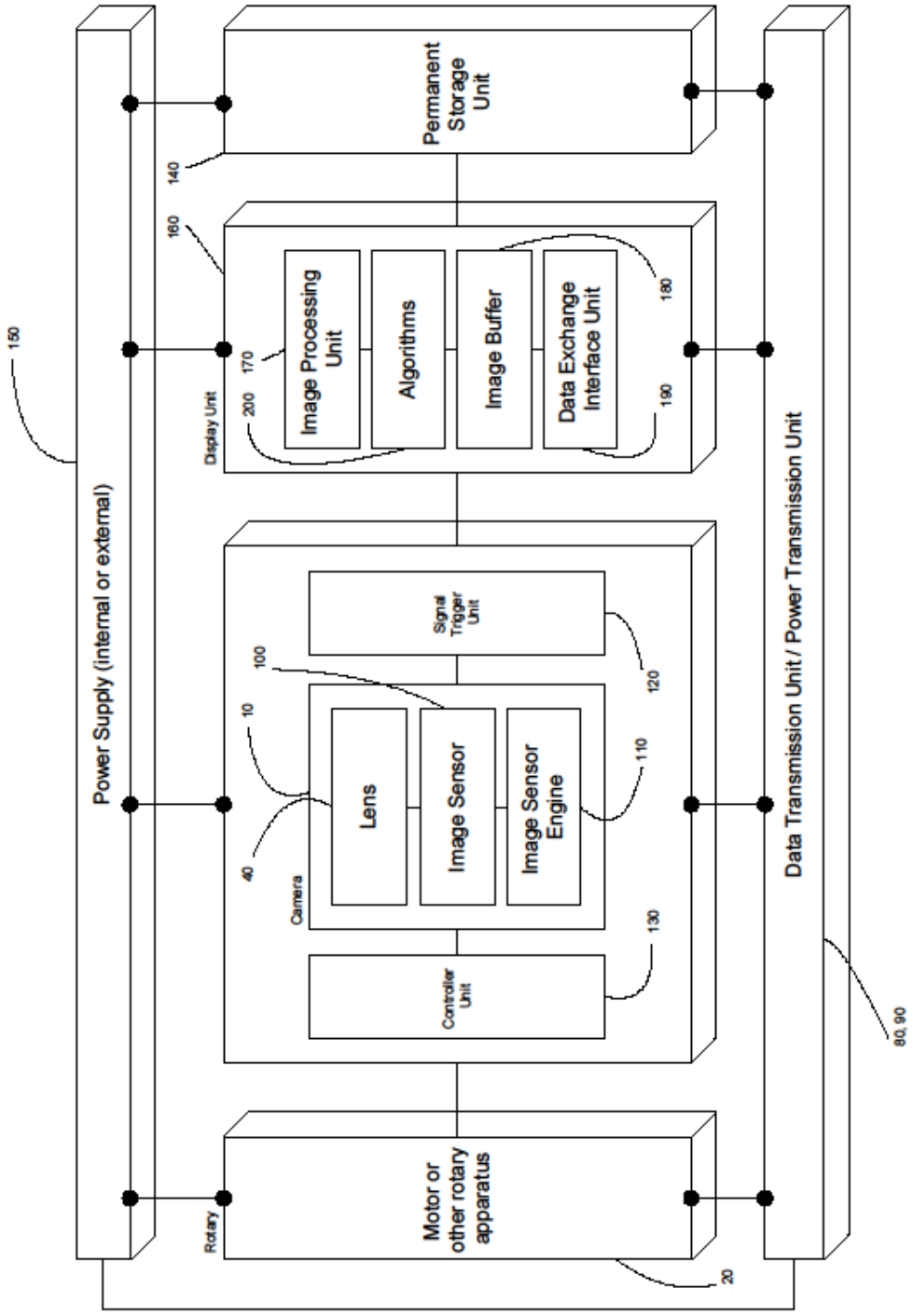
Power Supply (internal or external)
150
Permanent Storage Unit
140
160
Display Unit
Image Processing Unit
170
Algorithms
Image Buffer
Data Exchange Interface Unit
180
190
200
Signal Trigger Unit
120
100
10
Lens
Image Sensor
Image Sensor Engine
110
40
Camera
Controller Unit
130
Motor or other rotary apparatus
Rotary
20
Data Transmission Unit / Power Transmission Unit
80, 90

Fig. 1


Field view
1. rotation
2. rotation
3. rotation
4. rotation
5. rotation
6. rotation
7. rotation
8. rotation
9. rotation
10. rotation
10 images
10 images
10 images
Panorama view
10 images
10 images
10 images
10 images
10 images
10 images

Fig. 2