REMARKS/ARGUMENTS

After the foregoing Amendment, claims 1, 3-6, 8, 9, 12-31, and 33-35 are currently pending in this application. Claims 2, 7, 10, 11, and 32 are canceled without prejudice. Claims 1, 3-6, 8, 9, 12, 14, 16, 17, 20, 21, 23, 25-31 and 33 are amended. New claims 34 and 35 are added.

Claim Rejections - 35 USC § 101

Claims 1, 3-6, 8-9, 11-31, and 33 are rejected under 35 U.S.C. § 101 because "the claimed invention is directed to a non-statutory subject matter because the surveillance system is directed toward a system that could be carried out by a human being wherein the one or more cameras and image processing system are performed by exemplary eyes and mental processing." Applicant respectfully disagrees.

Claim 1 is directed to a surveillance system, which qualifies as patent eligible subject matter, i.e., a machine. Section 2106 of the Manual of Patent Examining Procedure defines a machine as "a concrete thing, consisting of parts, or of certain devices and combination of devices". The surveillance system of claim 1 is a concrete thing, comprising certain devices: "one or more cameras for capturing images ... and an image processing system". In addition, claim 1, as amended, recites the following features:

> wherein the image processing system is configured to generate a robust edge map from the captured images,

> wherein the image processing system is configured to compare the composite background edge map and the robust edge map, and remove background edges to extract a suspected edge map of FOD.

(Emphasis added). At least the features emphasized above require complex computations and image processing beyond the capabilities of a human being. For example, a human being is incapable of "generate[ing] a robust edge map from the captured images". For at least these reasons, Applicant believes claim 1 is directed to patentable subject matter.

Claim 11 has been canceled, therefore this rejection is now moot with respect to claim 11. Claims 3-6, 8, 9, 12-31, and 33-35 are dependent upon claim 1, and Applicant believes these claims are also directed to patentable subject matter at least by virtue of their dependencies. In view of the above, withdrawal of the 35 U.S.C. § 101 rejection is respectfully requested.

Claim Rejections - 35 USC § 102

Claims 1, 3-6, 8-9, 11-31, and 33 are rejected under pre-AIA 35 U.S.C. 102(e) as being anticipated by U.S. Patent No. 8,111,289 to Zruya et al. (hereinafter "Zruya"). Applicant respectfully traverses the rejection for at least the following reasons.

Claim 1, as amended, recites, in pertinent part:

> wherein the image processing system is configured to subject the captured images to background learning, and generate a composite background edge map during background learning, the composite background edge map comprising an adaptive background edge map, a previously learned and saved day or night background edge map, and a seasonal marking map generated for a particular season or weather condition,

...
wherein the image processing system is configured to generate a robust edge map from the captured images,
wherein the image processing system is configured to compare the composite background edge map and the robust edge map, and remove background edges to extract a suspected edge map of FOD.

The elements of Claim 1 referred to above relate to an "**edge detection**" image processing technique. Zruya fails to provide any teaching with respect to a surveillance system for detecting a foreign object, debris, or damage (FOD) on a runway using an "**edge detection**" technique that requires at least the following elements: "wherein the image processing system is configured to subject the captured images to background learning, and **generate a composite background edge map** during background learning, **the composite background edge map comprising an adaptive background edge map, a previously learned and saved day or night background edge map**, and a seasonal marking map generated for a particular season or weather condition", "wherein the image processing system is configured to **generate a robust edge map** from the captured images", and "wherein the image processing system is configured to **compare the composite background edge map and the robust edge map**, and remove background edges to extract a suspected edge map of FOD", as recited in Claim 1.

Zruya teaches an image processing method that uses a "**background subtraction**" technique. This is entirely different from the "**edge detection**" technique as recited in Claim 1.

Zruya's "background subtraction" technique consists of two stages, i.e., a pixels processing stage (*Zruya*, Col. 9, ll. 60 – Col. 10, ll. 38) and a logic processing stage (*Zruya*, Col. 10, ll. 39-54). The pixels processing stage is used to detect moving and static objects in images. (*Zruya*, Col. 9, ll. 62 – Col. 10, ll. 38). The logic processing stage involves the measurement of detected pixels that may represent a dangerous object (i.e., the suspected objects) by using different parameters, in order to determine whether the suspected objects are dangerous or not. (*Zruya*, Col. 10, ll. 39 – Col. 10, ll. 54.) The image processing method taught by Zruya compares each pixel in a current photo with a corresponding pixel (at the same corresponding location) from previous photos using a Gaussian Curve. (*Zruya*, Col. 9, ll. 62 – Col. 10, ll. 38). The Gaussian Curve is "generated from a **continuous** measurement" of pixel values (for each pixel) from a number of **previous photos**. (*Zruya*, Col. 9, ll. 66 – Col. 10, ll. 3). Whenever a specific pixel has a value which exceeds the dynamic threshold, this pixel is determined to be part of a suspected dangerous object. (*Zruya*, Col. 10, ll. 10-15).

As noted in paragraphs [0009] and [0010] of the present application, use of the "background subtraction" technique, as employed by Zruya, for detecting foreign objects, debris, or damage (FOD) has a number of problems. For example, the pixel properties (of the detected object and the background) may not be sufficient to distinguish between the background and the foreground pixels (which represent the

detected object). The background may also be subject to changes due to noise, clutter, extraneous events, variations in illumination conditions and weather conditions. Furthermore, "background subtraction" is dependent on ambient lighting conditions and is not suitable for low lighting conditions, which cause significant problems in pixel characterization.

The "**background subtraction**" technique may be contrasted with "**edge detection**" technique of Claim 1, which involves finding the **boundaries** of objects within an image and measuring and modelling **sharp discontinuities** in pixel values (e.g., brightness) of adjacent or neighboring pixels. "Edge detection" may also be used for identifying points in a digital image at locations where the image brightness **changes sharply** (sharp discontinuities) with respect to the background of the image. The points at which image brightness changes sharply are typically organized into a set of curved line segments termed edges. An **edge map** typically comprises one or more edges derived by performing edge detection on a digital image. Thus, "background subtraction" as taught by Zruya relates to measurement and modelling of **continuities** in pixel values for each pixel at the corresponding same location in a number of previous photos to generate a Gaussian curve, whereas the "edge detection" technique relates to finding the **boundaries** of objects within an image and measuring and modelling **sharp discontinuities** in pixel values (e.g., brightness) of adjacent or neighboring pixels.

In addition, the image processing method taught by Zruya models and works based on a "**temporal relationship**" between each pixel in a current photo with pixels in the corresponding same locations in previous photos. In contrast, the "edge detection" technique models and works based on a "**spatial relationship**" between each pixel and its adjacent/neighboring pixels in the same photo.

For at least these reasons it is clear that Zruya uses a completely different technique, "**background subtraction**", than the "**edge detection**" technique recited in Claim 1. As a result, Zruya fails to teach an image processing system employing the "edge detection" technique that is configured to "generate **a composite background edge map** during background learning, the composite background edge map **comprising an adaptive background edge map, a previously learned and saved day or night background edge map**", "generate **a robust edge map**", or **compare** the **composite background edge map** and the **robust edge map**. For at least these reasons, Zruya fails to teach or suggest each element of Claim 1. Therefore, Applicant believes Claim 1 is allowable over the cited reference.

With regard to new claim 34, both the image processing stage and logic processing stage of Zruya fail to teach or suggest, "wherein the image processing system is configured to perform edge filtering on the suspected edge map to locate and filter out light reflection on the runway resulting from environmental conditions", as claimed. Since Zruya does not use an "edge detection" technique, it

does not disclose edge filtering on a suspected edge map much less disclose specifically doing so to "locate and filter out light reflection on the runway resulting from environmental conditions". The features of claim 34 advantageously prevent false detection of runway light reflection resulting from environmental conditions as FOD. Prior art systems, such as those of Zruya, may inaccurately detect light reflections resulting from environmental conditions as FOD and still have to rely much on human judgment to decide whether they are indeed FOD. At best, Zruya only generally discloses use of Forward Looking Infra Red (FLIR) cameras to handle bad weather conditions. (*Zruya*, Col. 13, ll. 44-50). Zruya does not provide any further description on how the images captured by a FLIR camera are processed during the bad weather conditions, much less much less how the images would be handled through an edge filtering technique in environmental conditions having light reflections.

Claims 3-6, 8, 9, 12-31, and 33-35 are dependent upon Claim 1, and the Applicant believes these claims are allowable over the cited reference for at least the reasons provided above.

Based on the arguments presented above, withdrawal of the 35 U.S.C §§ 101 and 102 rejections of claims 1, 3-6, 8, 9, 11-31, and 33 is respectfully requested.

Conclusion

If the Examiner believes that any additional minor formal matters need to be addressed in order to place this application in condition for allowance, or that a telephonic interview will help to materially advance the prosecution of this application, the Examiner is invited to contact the undersigned by telephone at the Examiner's convenience.

In view of the foregoing, Applicant respectfully submits that the present application is in condition for allowance and a notice to that effect is respectfully requested.

Respectfully submitted,

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