

THE BOUNCE IMAGING EXPLORER

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Abstract

The Bounce Imaging Explorer is an **assistive device** for rescue or hazard situations where a "first look" of a space can sometimes make the difference between life and death. Using six fisheye cameras it records its surroundings, generates a panoramic view of the space and sends it to a mobile device or tablet (running Android OS) via wireless communication. Due to its final use, the device had to be capable of working with noisy images and be fast enough for real-time image acquisition. These requirements were fulfilled with the final prototype.

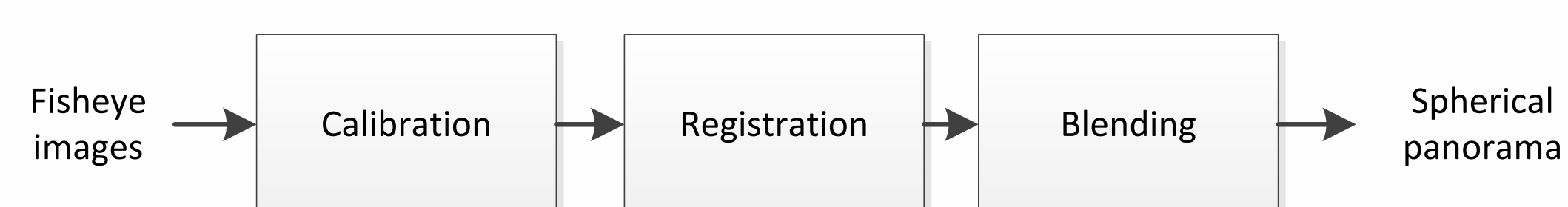
The Explorer interface

The Bounce Imaging Explorer [2] consists of a bounce sphere with 6 fisheye cameras (among other devices) and an Android application for cellphones or tablets. Every half second, the sphere creates a panoramic of its surroundings which can be visualized either as equirectangular or as a spherical projection in the app.



The Computer Vision Element

Image processing module of the Explorer



- A fisheye lens creates a very wide-angled but severely distorted image which can make the calibration process more difficult. Our intrinsic calibration for these images is based on the work of Ying et al. [1].
- Inherent to the registration is the *parallax problem* given the structure of the sphere.
- The extrinsic calibration and registration of the images are new methods yet unpublished (waiting for patent).
- All the code **must be** optimized, regarding memory and speed, for an embedded implementation.

Results

Remember! We are dealing with noisy images with severe light issues.

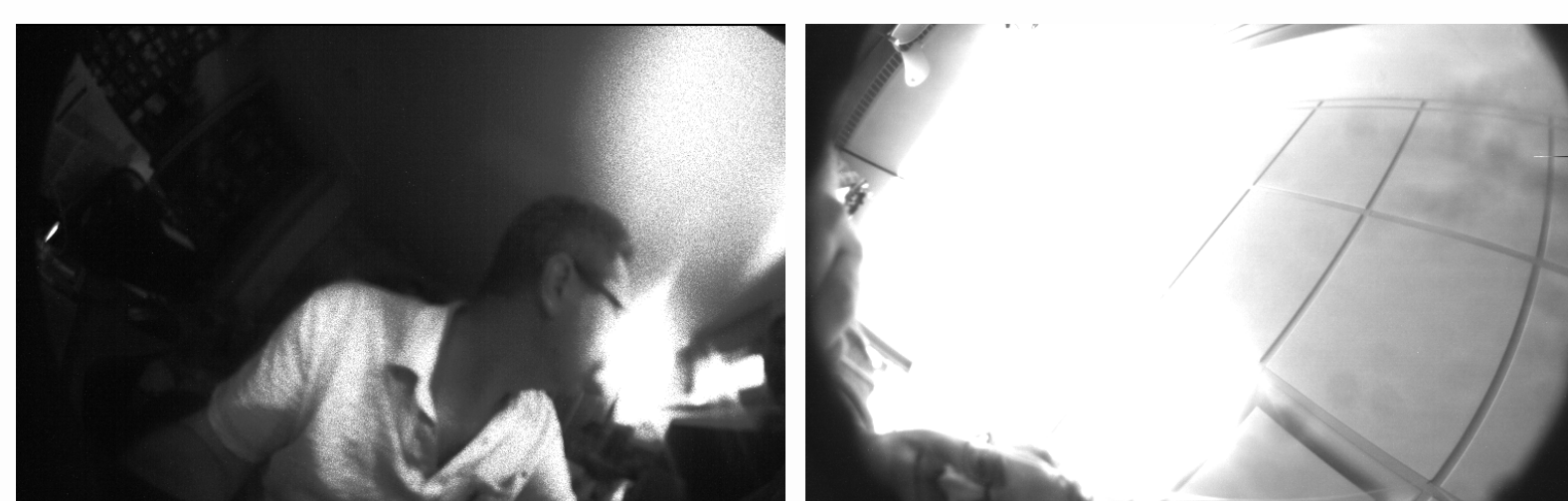
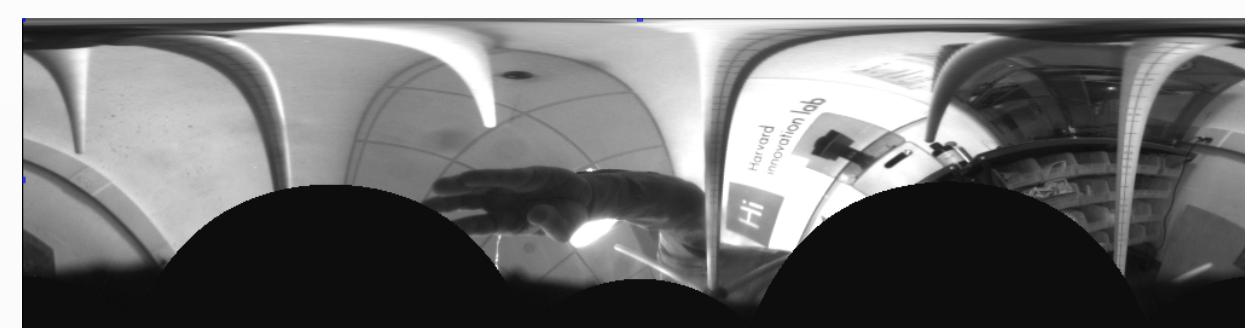


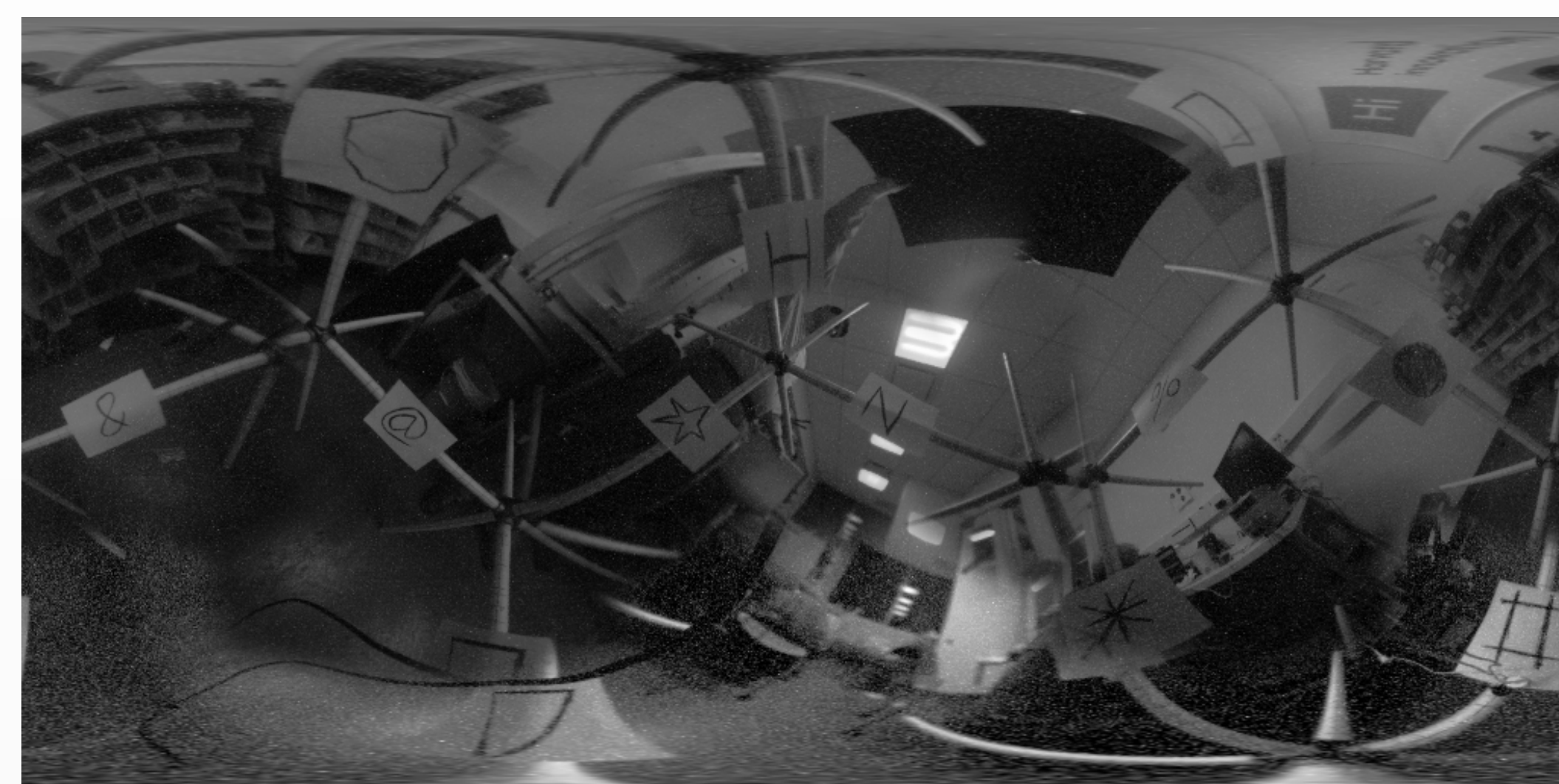
Image after first registration. Each fisheye image is allocated in the spherical projection using its intrinsic and extrinsic calibration.



Fisheye input

Image allocated using calibrations

- Parallax issues still remained. Those had to be overcome by a second registration process.
- Compromise accuracy for speed, given the embedded device.
- Entire process takes less than two seconds in prototype.



Conclusion

The final prototype shows that it is feasible to run demanding tasks as Image Processing in embedded systems under real-time limitations with good performance results.

Acknowledgements

This poster only contemplates the Image Processing side of the Explorer project. The entire Bounce Imaging team [2] is responsible for the final product and their work must be acknowledged.

References

- [1] Ying, X; Hu, Z and Zha, H. *Fisheye Lenses Calibration Using Straight-line Spherical Perspective Projection Constraint*, Proc. Asian Conference on Computer Vision (ACCV 2006), Lecture Notes in Computer Science (LNCS), pp. 61-70, India, January 13-16, 2006.
- [2] Bounce Imaging company. <http://bounceimaging.com/>