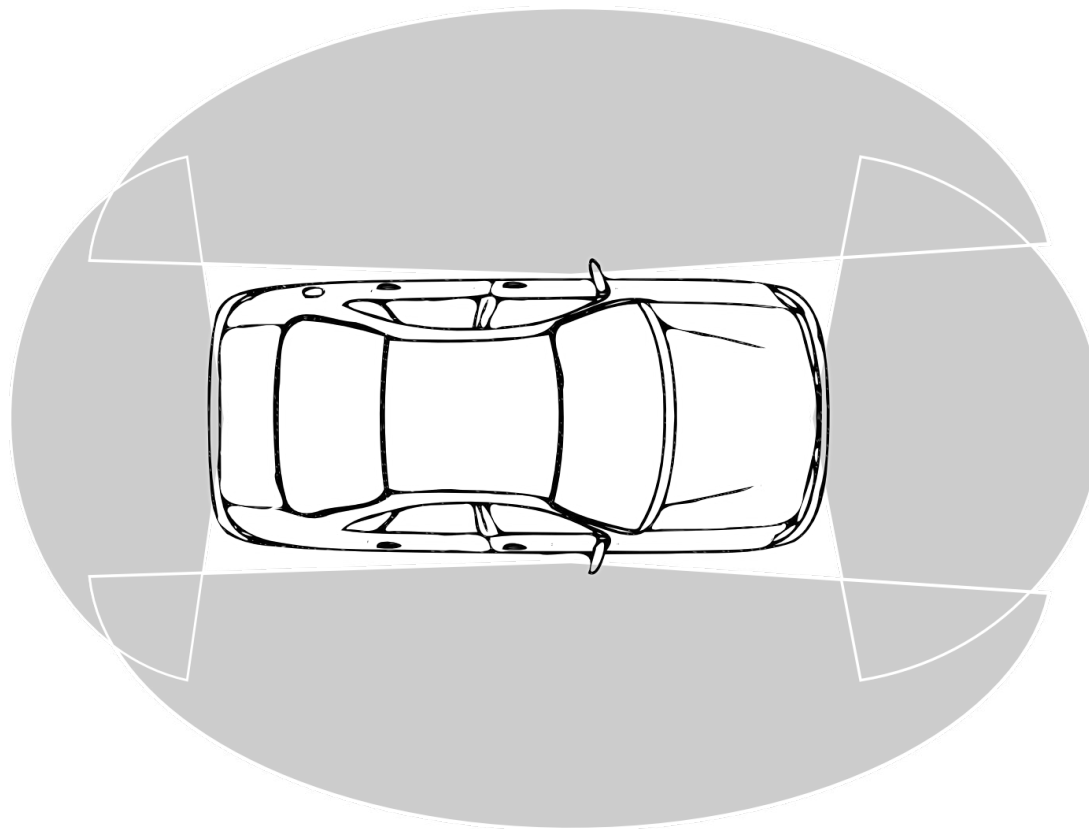


A System for Vehicle Surround View

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System Description

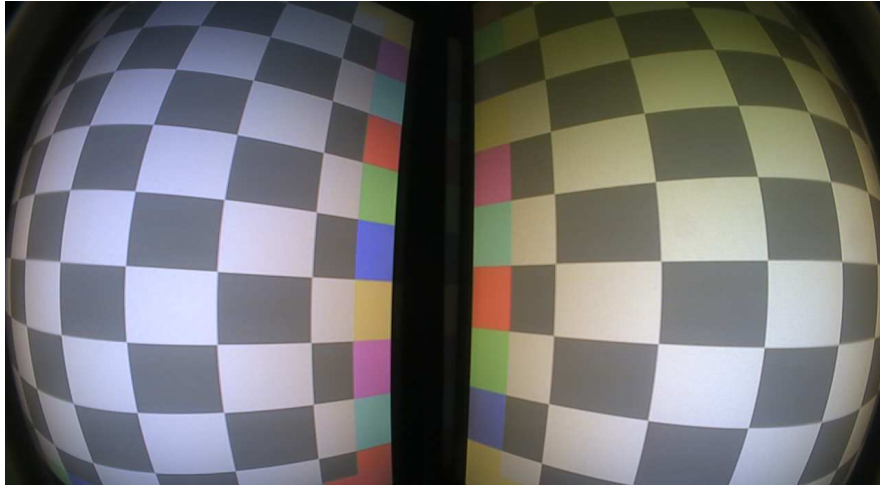
- 4 fish-eye cameras, display, image processing Unit



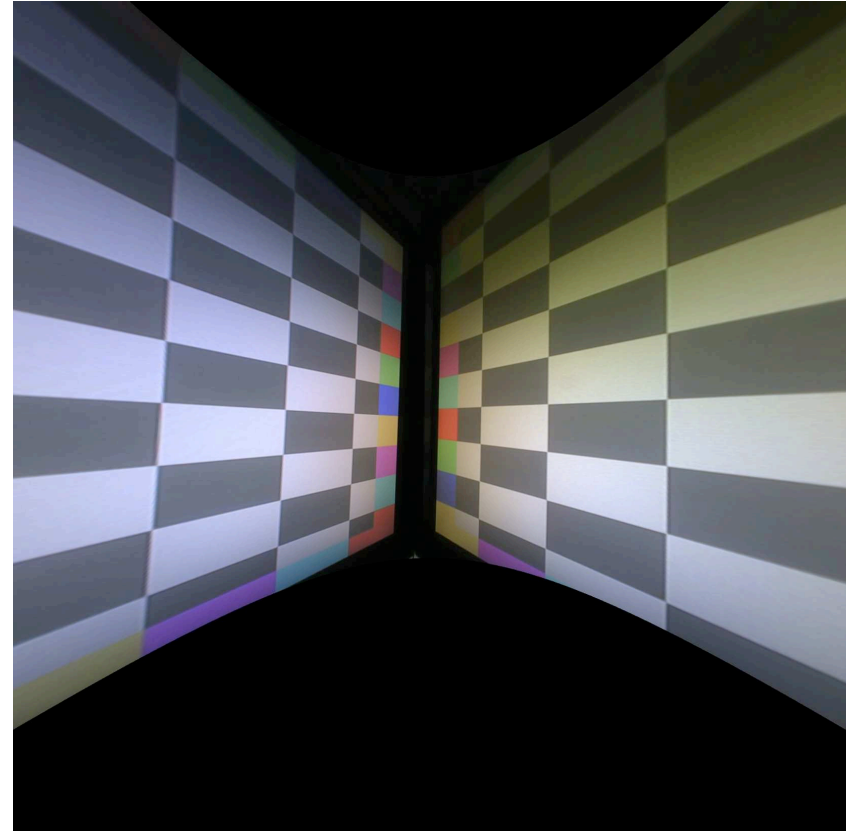
Problems and Requirements

- Individual camera calibration
 - FOV greater than 180° (hard to capture)
 - Robustness to lighting variations
 - Industrial production
- Four-camera system calibration
 - Mechanical mounting misalignment problem
 - Must work in industrial production environment
- Final output: bird's eye view

Calibration patterns



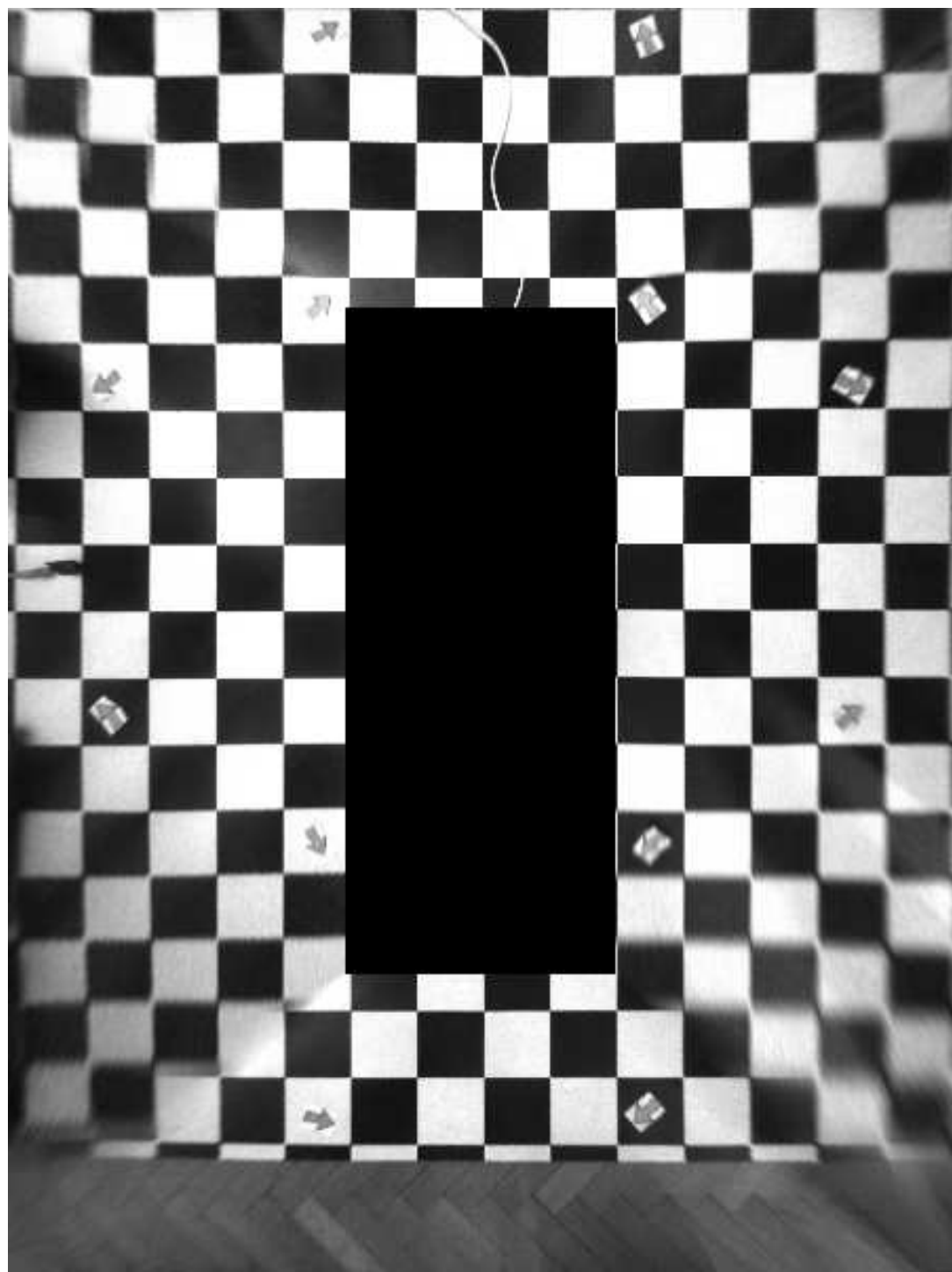
As imaged by camera



Undistorted after calibration

Camera system calibration

- Two stage calibration procedure
 1. Initial vehicle calibration
 2. End of production line calibration
- Initial vehicle calibration (done only once)
 - Performed in laboratory conditions
 - Accurately positioned markers on the floor surrounding the vehicle
 - Manual marker labeling required (due to severe fisheye distortion)
 - Accurate extrinsic parameters are obtained





Conclusion

- Developed image processing methodology for:
 - Individual camera calibration
 - Calibration of four-camera system
 - Generation of bird's eye view
- Real-time prototype implementation developed in FPGA

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 - FPGA development team: Davor Kovacec, Marko Vidović, Anita Cazin