Flame Speed in Spark-Ignited Low-Pressure Combustion

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Under the direction of M.W. Renfro

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Engineering Next Generation Energy Processes and Systems
Research Experience for Undergraduates (REU) Site Program

University of Connecticut

Experimental Setup

- Constant-volume bomb with optical access
- 13 ports allow access for ignition and measurements.
- Mixing is accomplished by metering gases into the test section via partial pressures.
- Mixture rests and diffuses for several minutes before ignition.
- Fuels used in this study: CH4, C2H6.

(Information from this slide taken from original presentation)

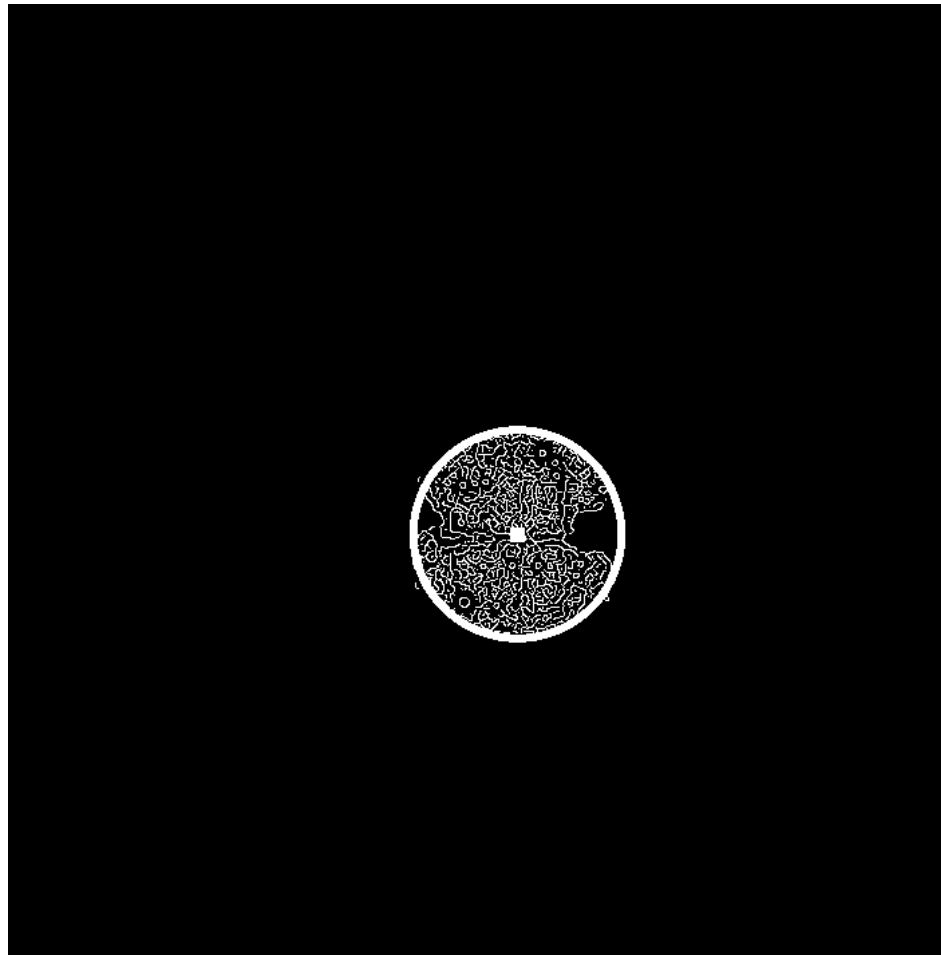**Engineering Next Generation Energy Processes and Systems**
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Optical Techniques
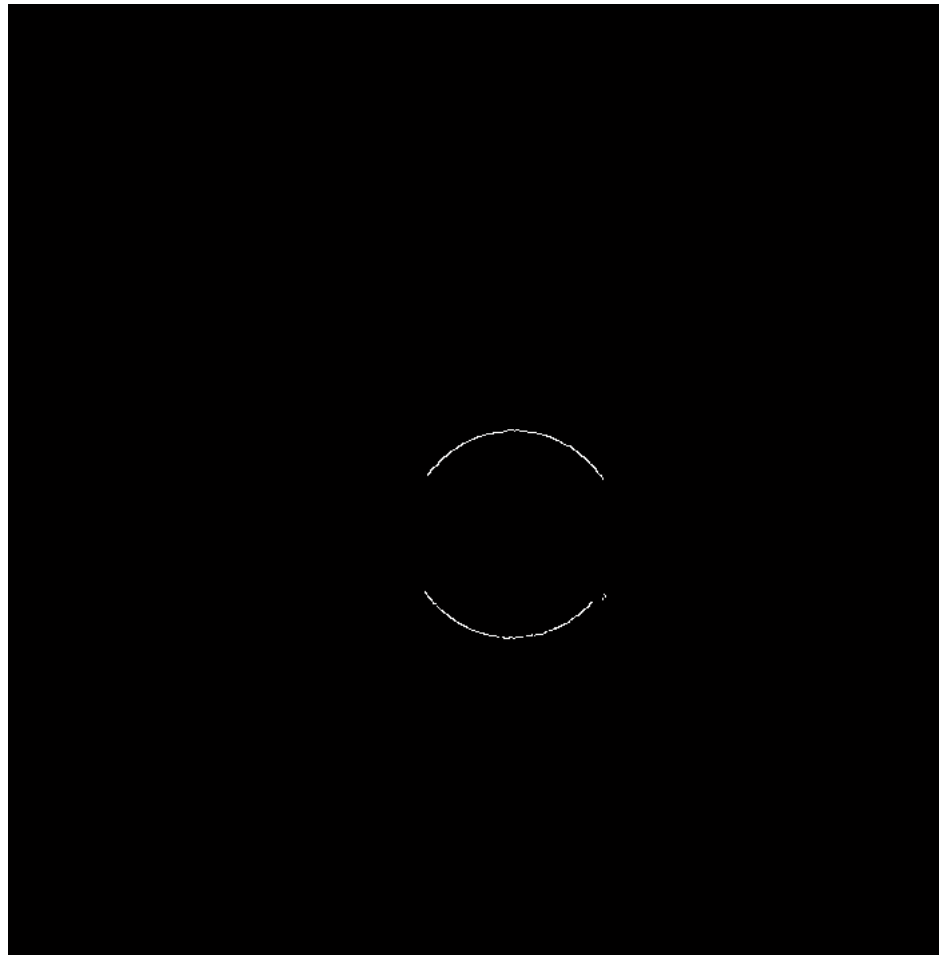

- Photron FASTCAM SA5

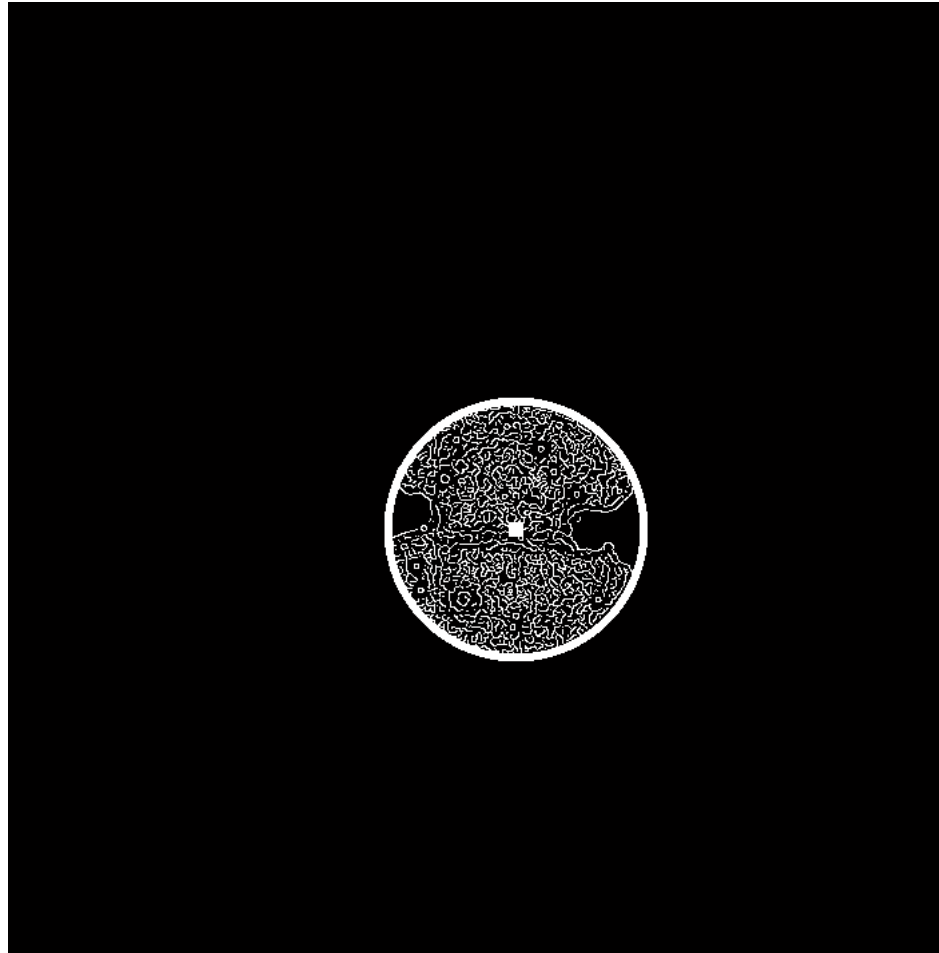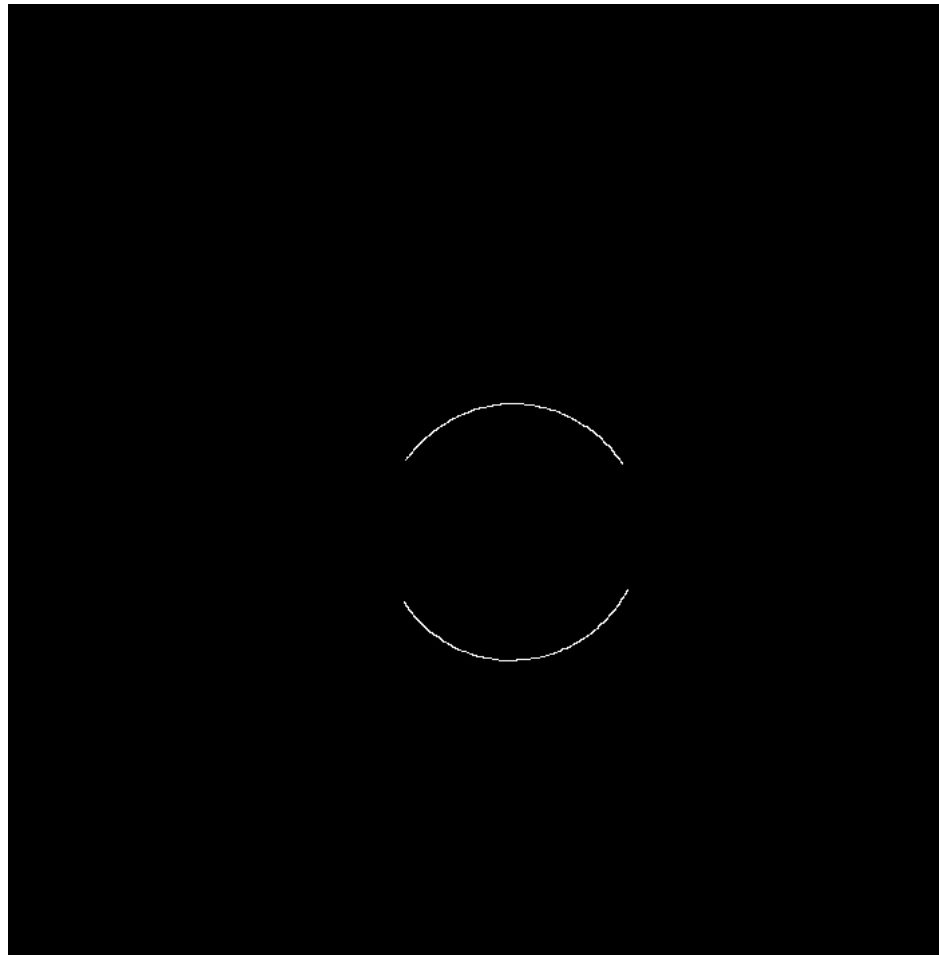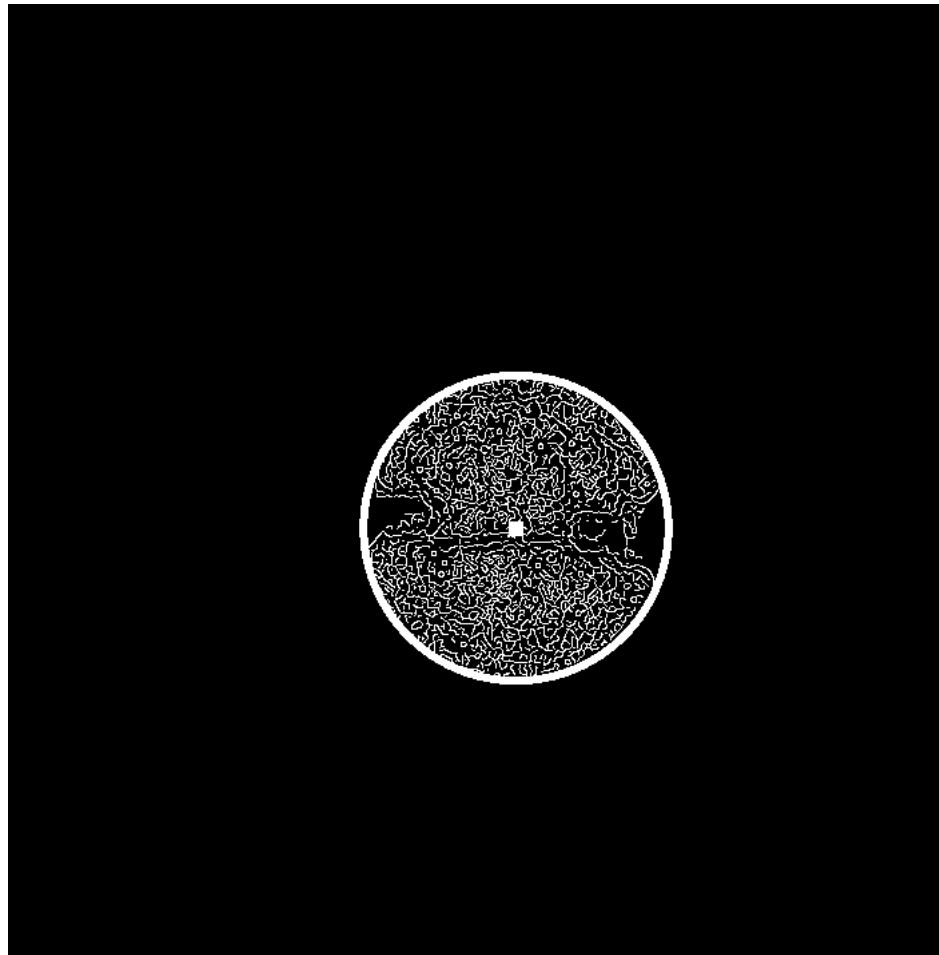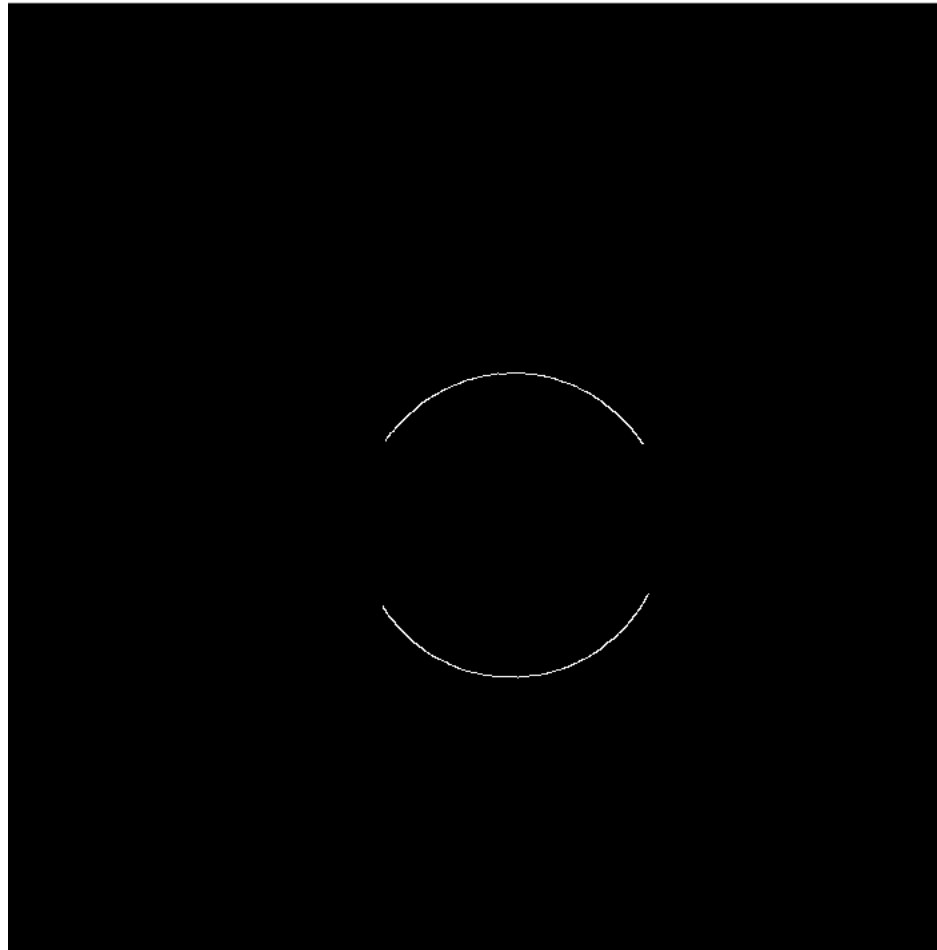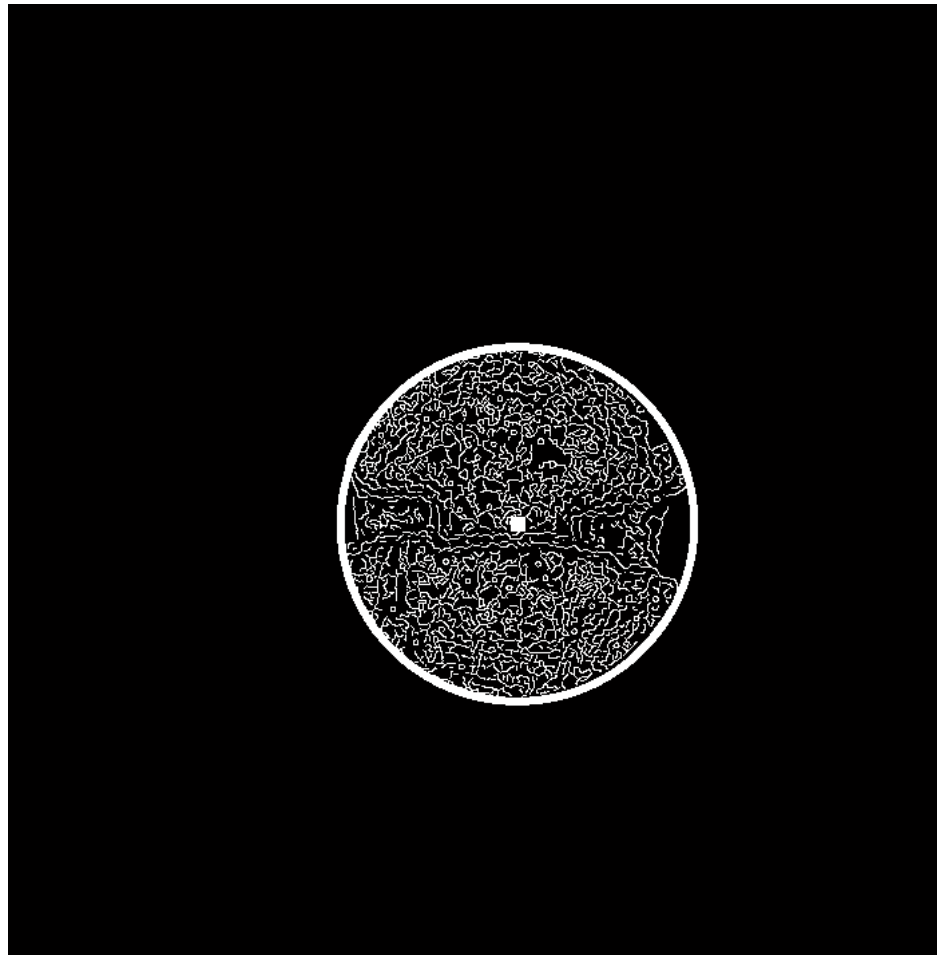- 2500-4000 frames per second

High Speed Video

Finding Flame Speed
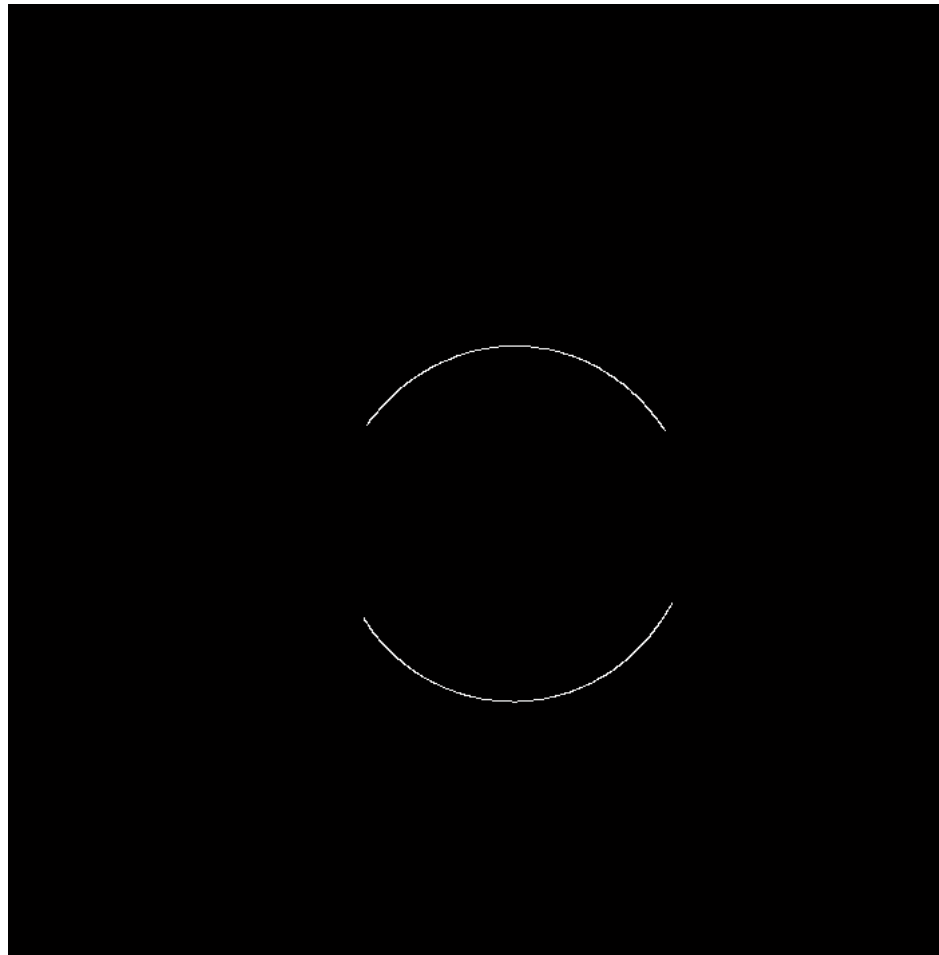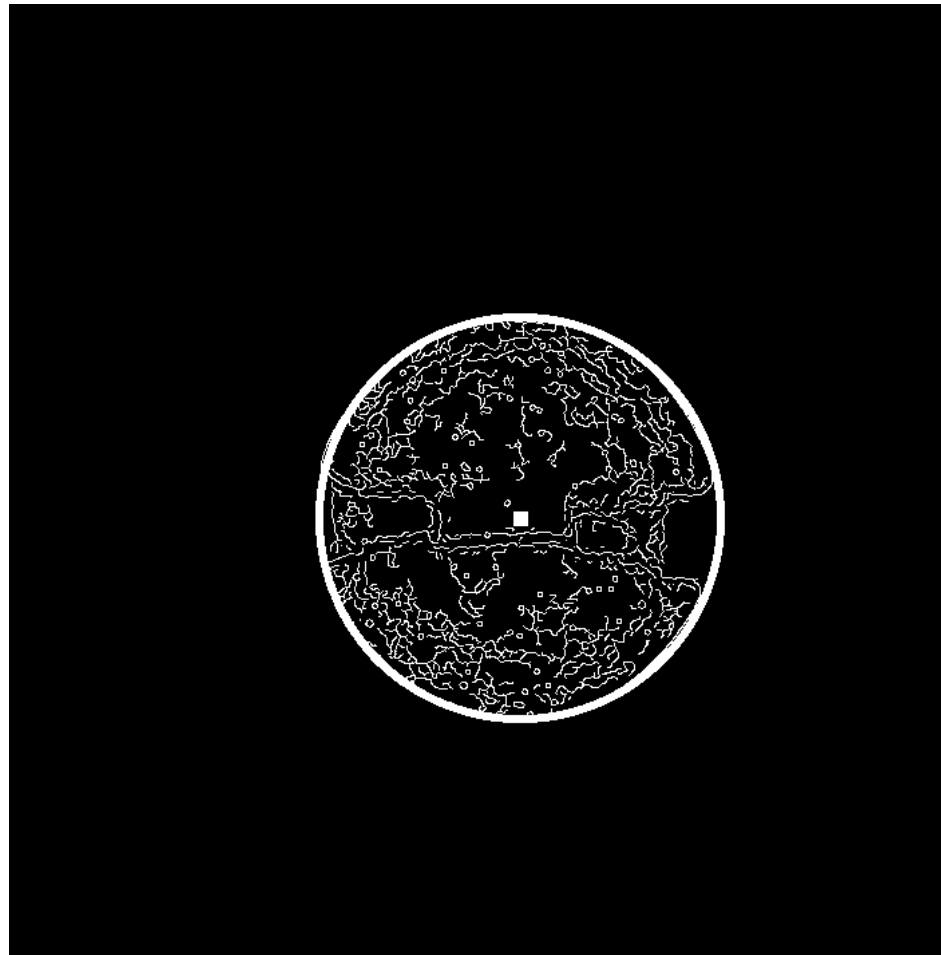
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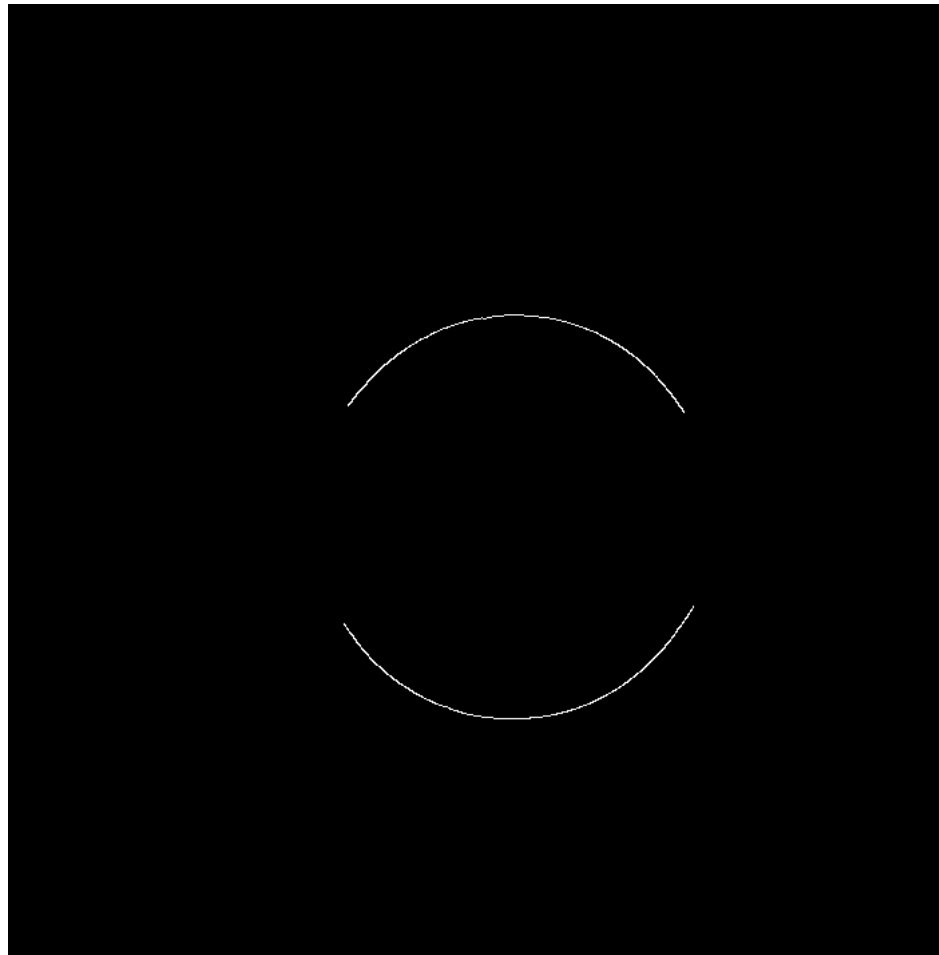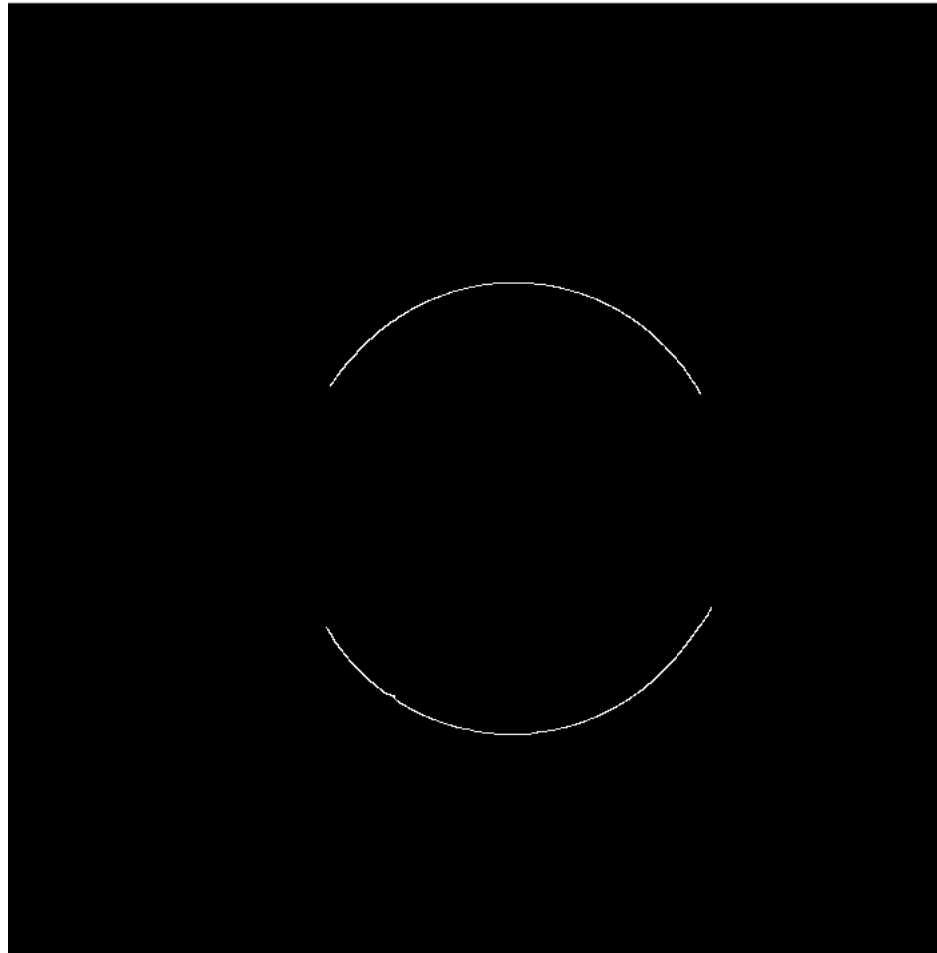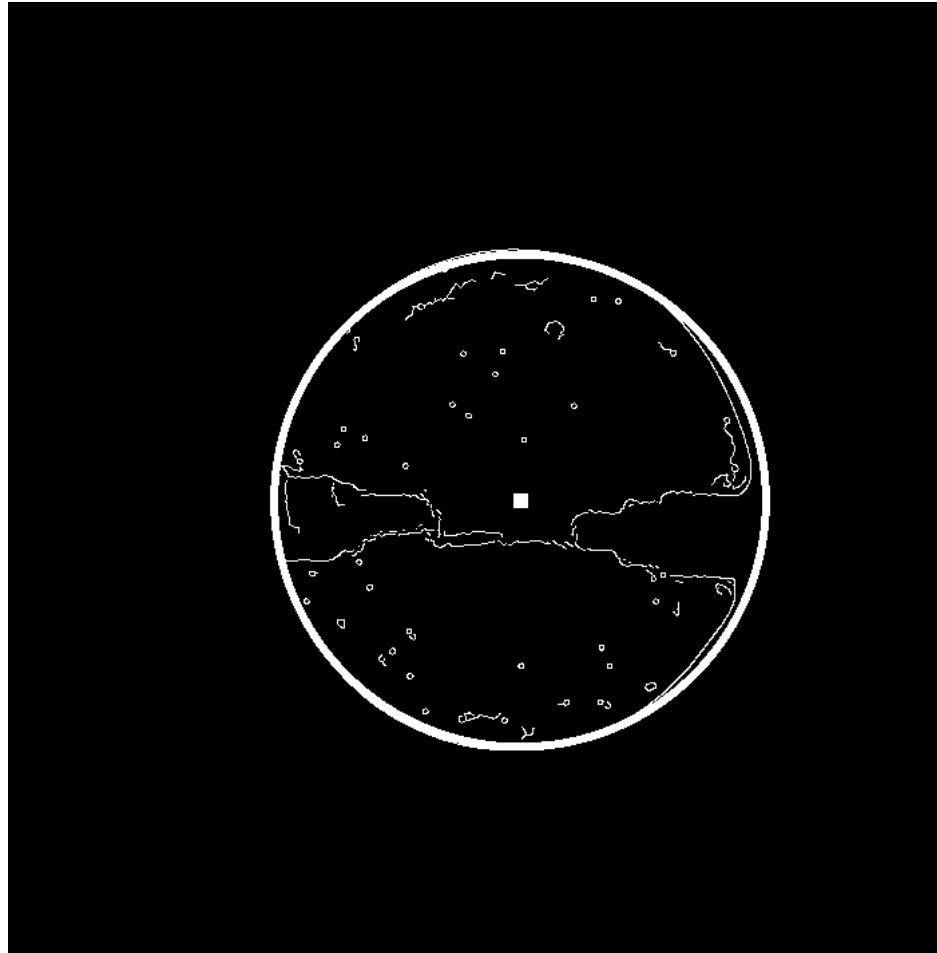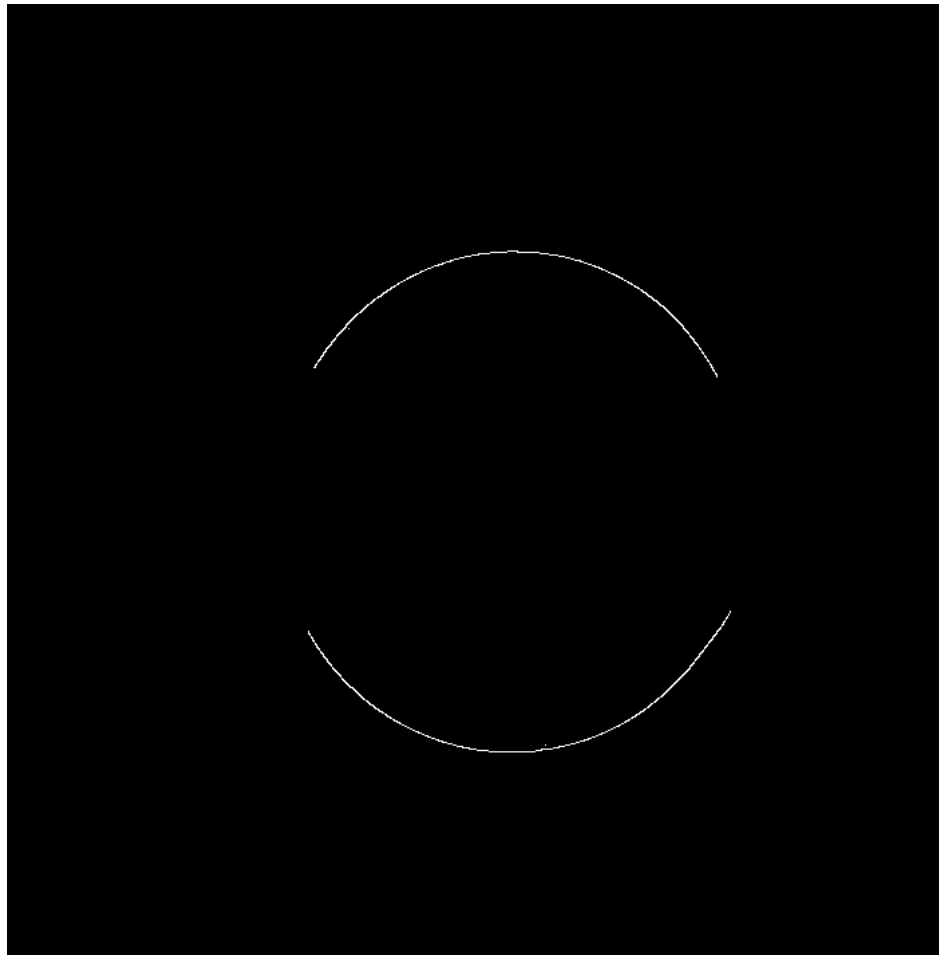
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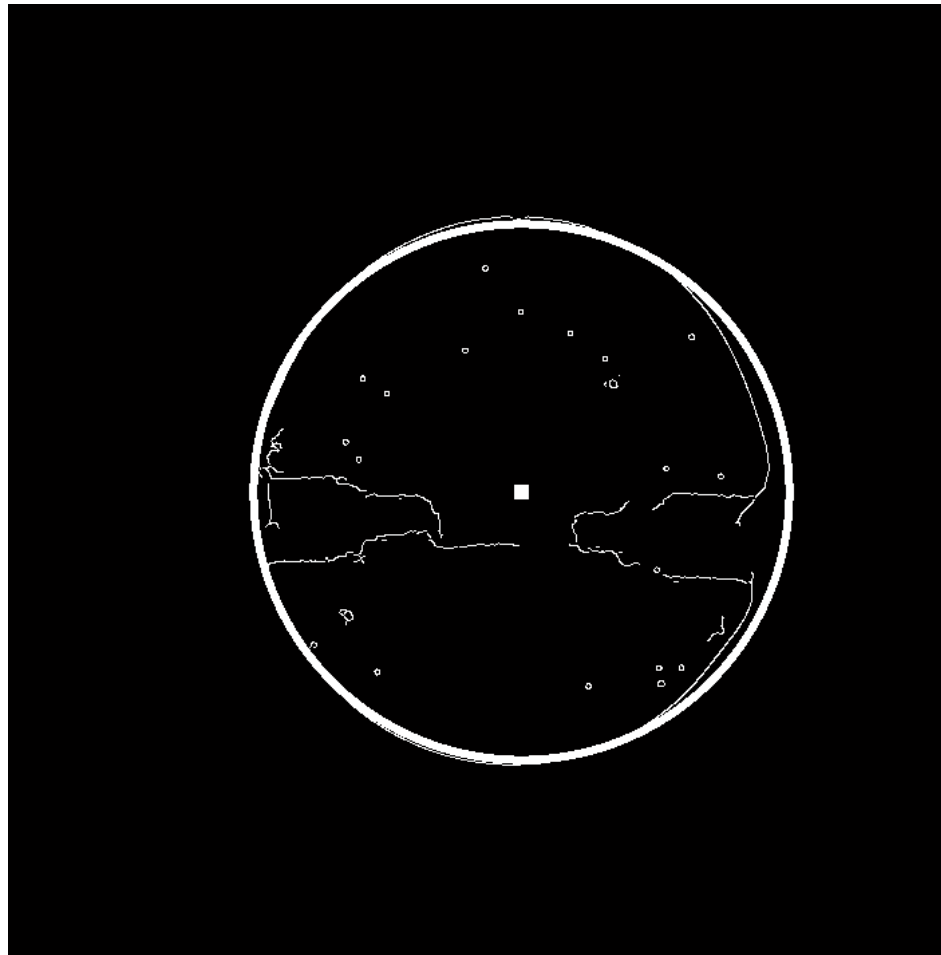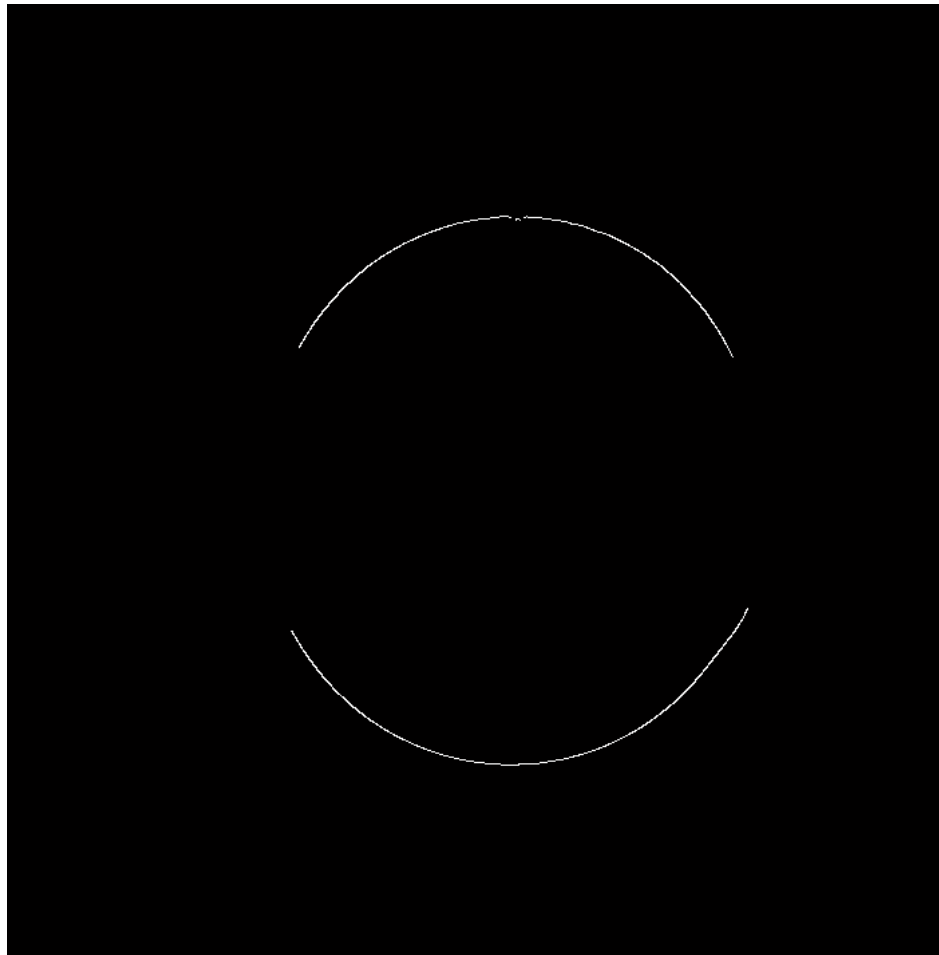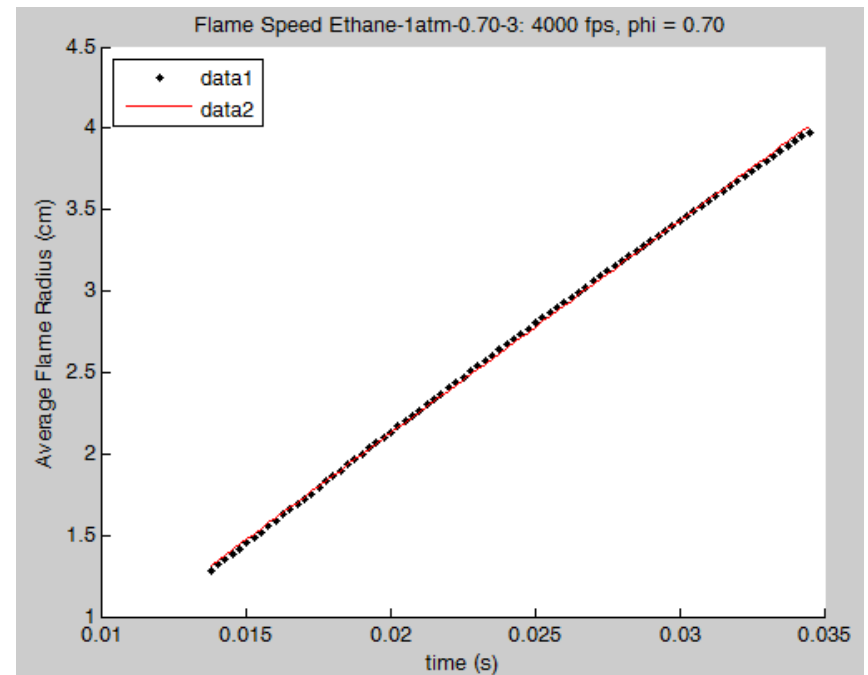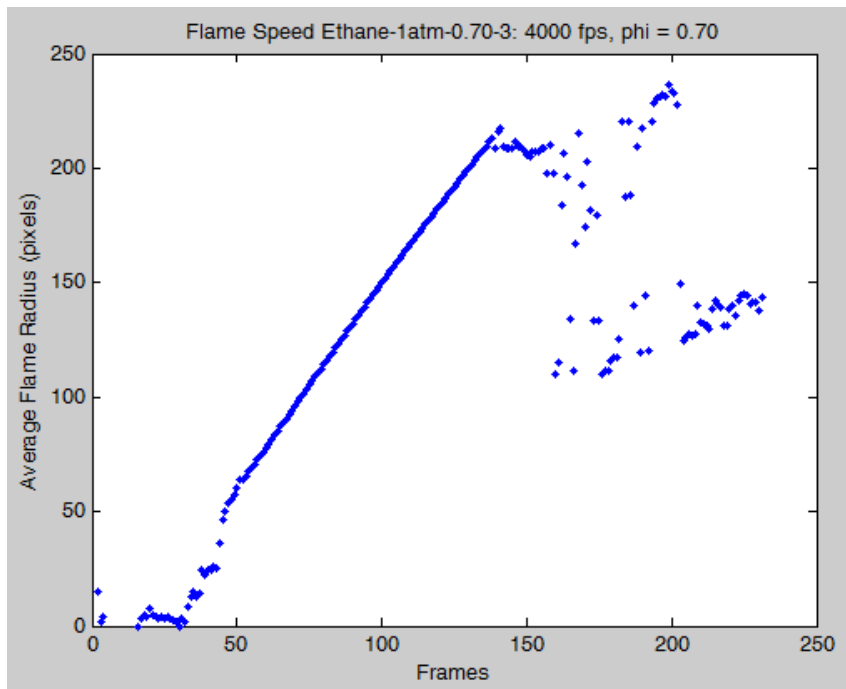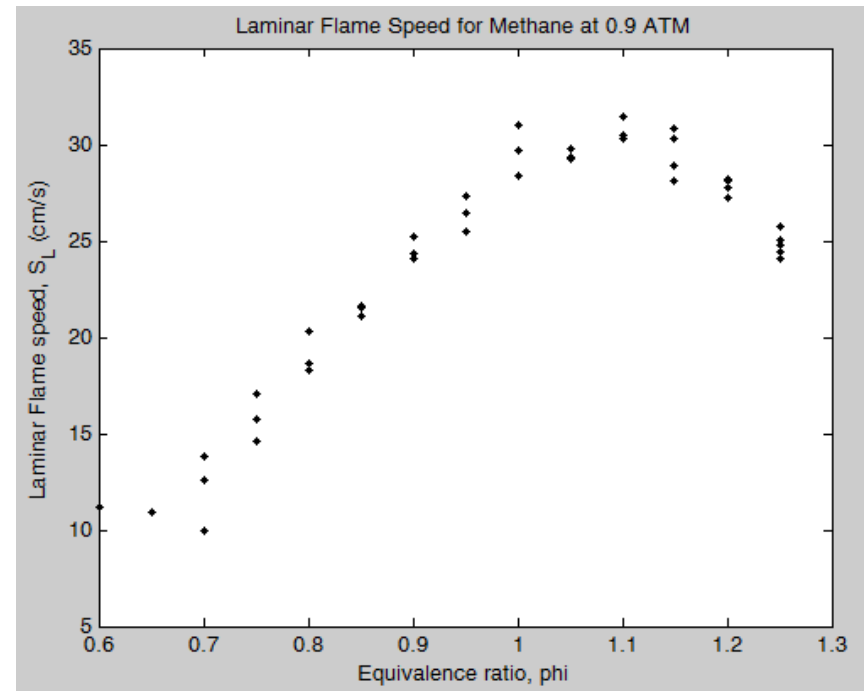# Finding Flame Speed

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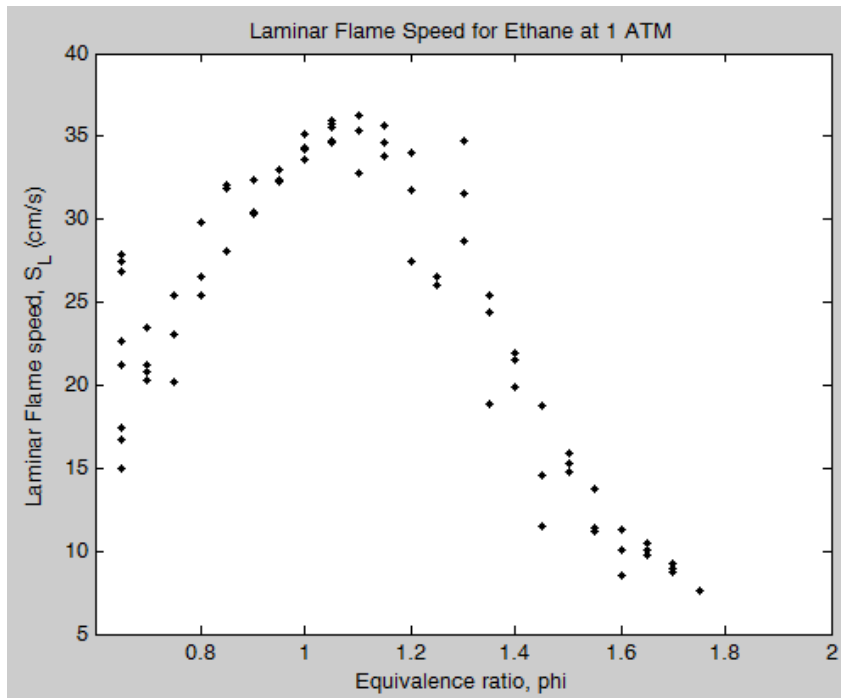Connecticut

Finding Flame Speed
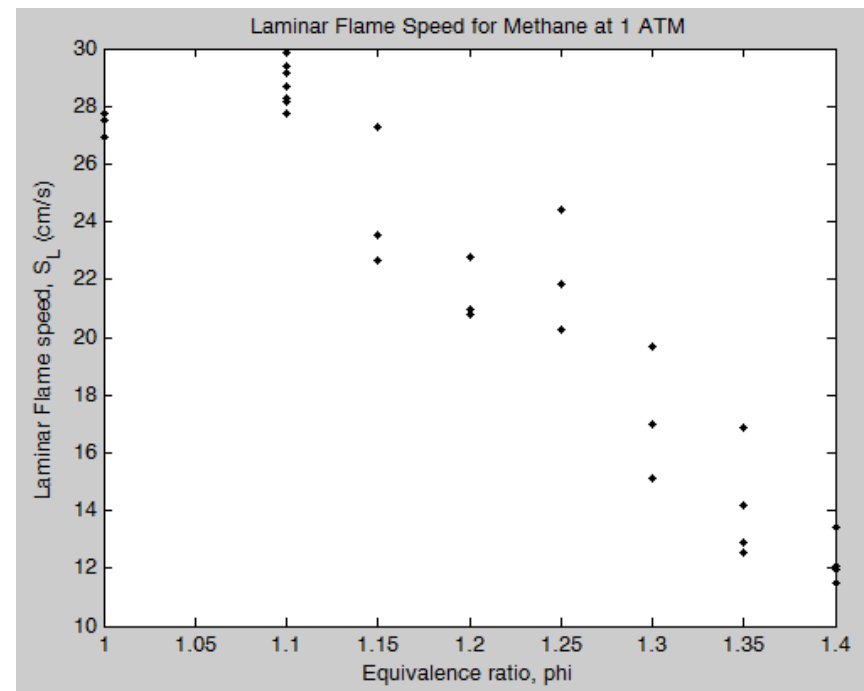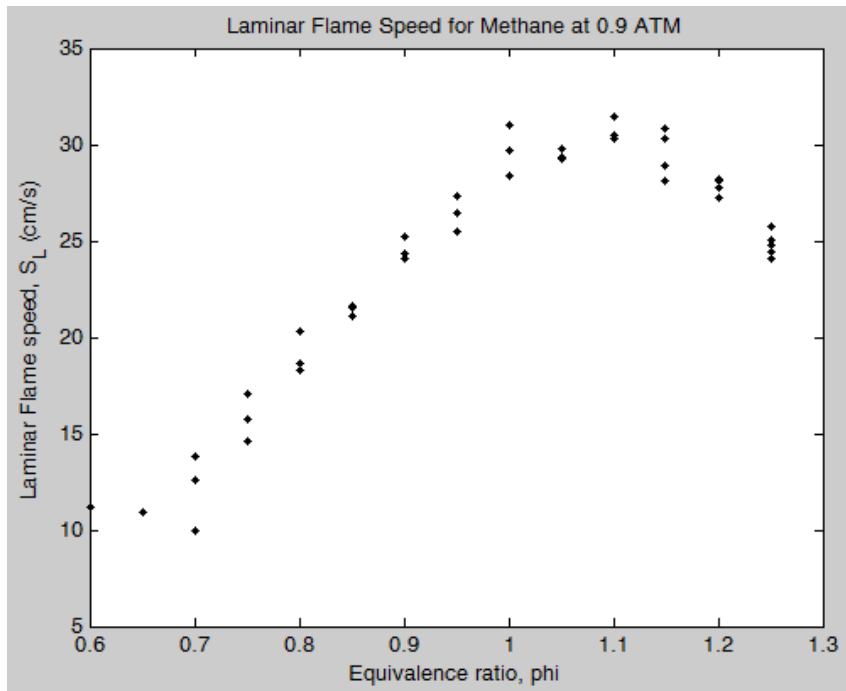
Finding Flame Speed

Finding Flame Speed

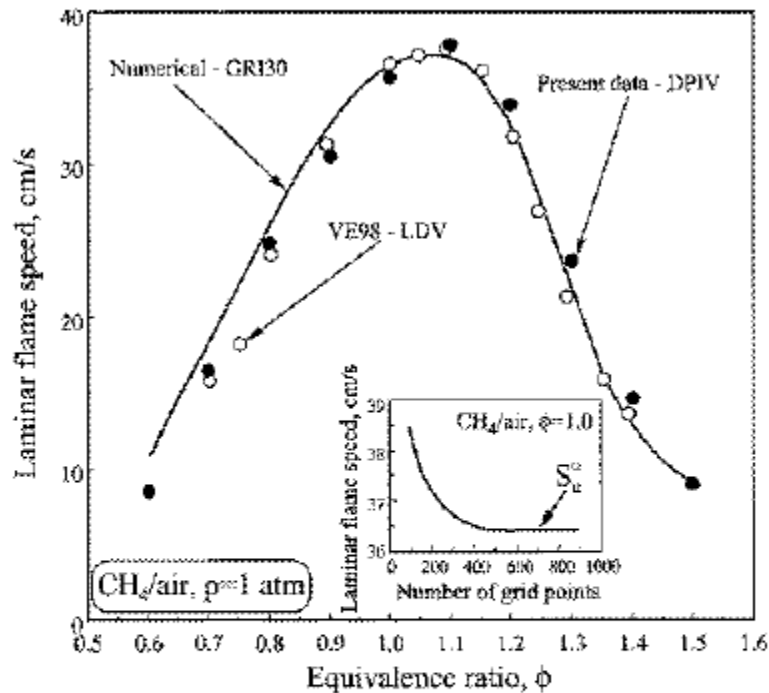# Flame Speed Trends

Flame Speed Trends

Previous Work


FIG. 2. Comparisons between the present experimental S_u^o data for atmospheric CH_4/air mixtures with those determined in VE98 and numerical predictions using GRI-Mech 3.0. (Inset) The dependence of the predicted S_u^o on the number of grid points used in the simulations.
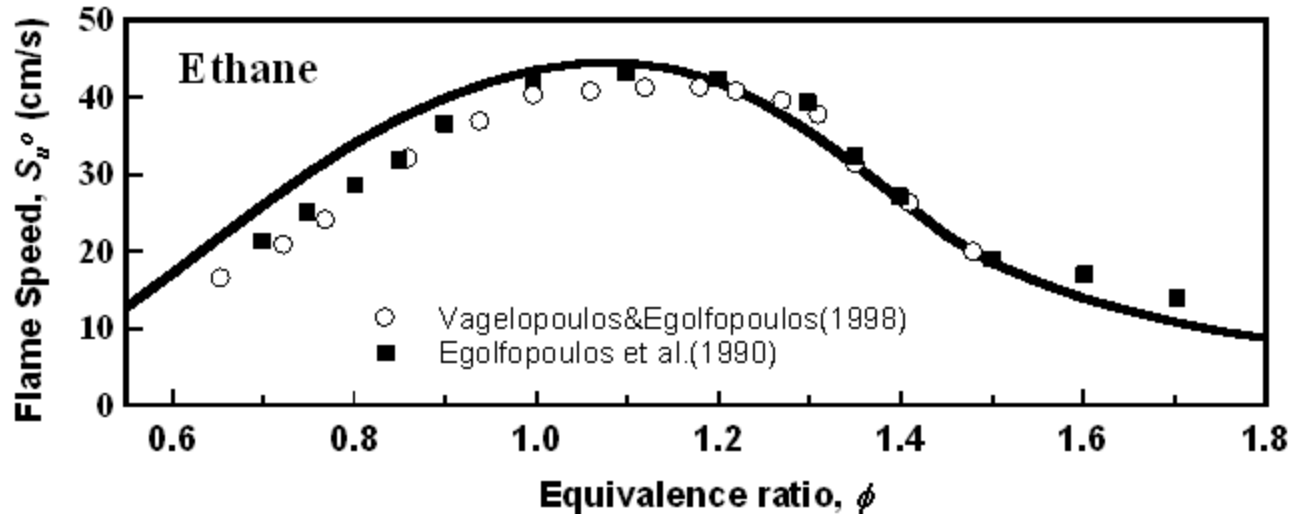
Dong, Y., Vagelopoulos, C.M., Spedding, G.R., and Egolfopoulos, F.N. *Proc. Combust. Inst.* 2002, 29, 1419.

Previous Work
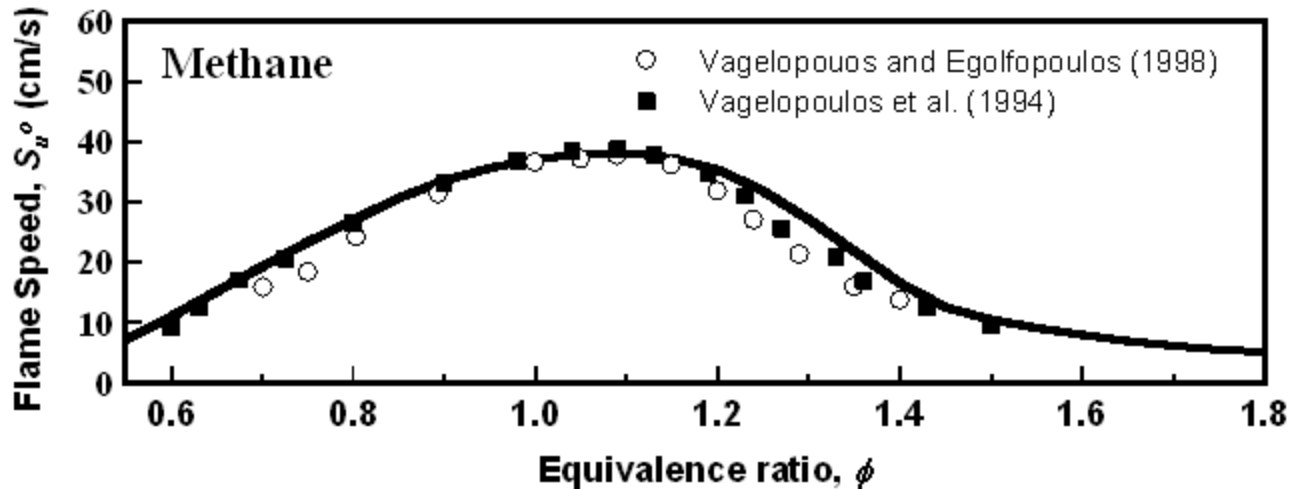
- Vagelopoulos, C.M., Egolfopoulos, F.N. *Proc. Combust. Inst.* 1998, 27, 513.

- Vagelopoulos, C.M., Egolfopoulos, F.N. Law, C.K. *Proc. Combust. Inst.* 1994, 25, 1341.

Previous Work

- Vagelopoulos, C.M., Egolfopoulos, F.N. *Proc. Combust. Inst.* 1998, 27, 513.

- Egolfopoulos, F.N., Zhu, D.L., and Law, C.K., *Proc. Combust. Inst.* 1990, 23, 471.

Future Work

- Peruse previous work to find potential sources of discrepancy

- Modify program parameters to quantify variation, error

- Finish documentation

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Thanks

- Dr. Michael Renfro

- Dr. Kevin Murphy

- Kathryn Gosselin

- Marc Schneider