Microfluidics based Worm Sorter

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1. Introduction

- The nematode Caenorhabditis Elegans is a widely adopted model organism for studying various neurobiological processes at the molecular and cellular level in vivo.
- With a small, flexible, and continuously moving body, the manipulation of C.elegans becomes a challenging task.
- A lab-on-a-chip (LOC) is a device that integrates one or several laboratory functions on a single chip of only millimetres to a few square centimetres in size is employed for screening of C.elegans.

Figure : A. C.elegans

2. Proposed System

- In particular , Pressure driven Micro Fluid channels are our interest to sort out C.elegans in a channel , based on GFP profiles by integrating two sets of emitting and detection fibers .

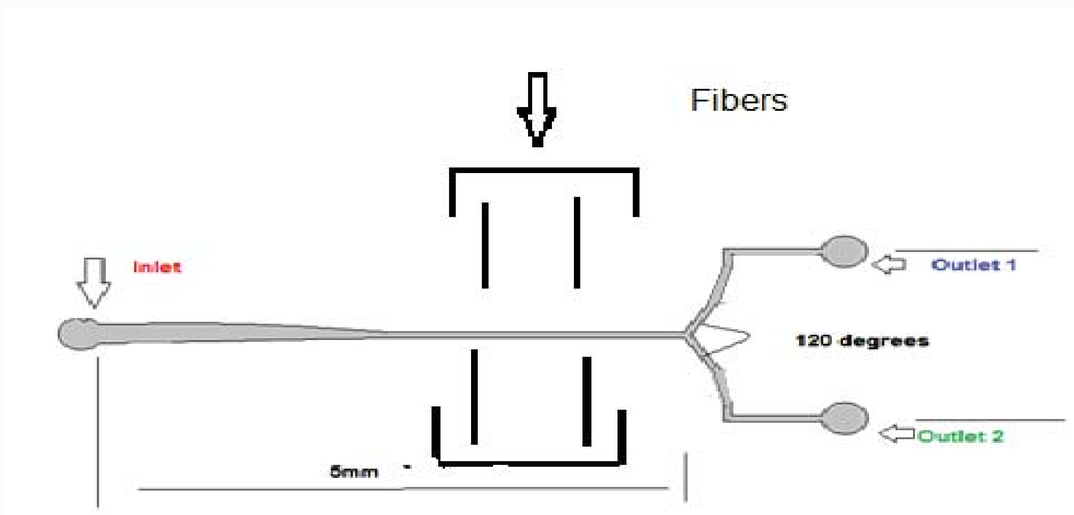

Figure: B: Y- Channel

- At some pressure flow from Outlet 1 to Inlet or Outlet 2 can be stopped…
- Is there any Numerical Value of Pressure??

3.Theorotical Approach

- By using Symmetry approach, Bernoulli's Equation, and Continuity Equation
  we obtained a Control Equation

- $\beta = \frac{PInlet}{POutlet1}$, $\theta = \frac{VOutlet1}{VInlet}$, P : Pressure, V :Velocity

- By solving the control equation
  For change in velocity of +10%
  variation in pressure is about 37%
  For change in velocity of -10%
  Variation in Pressure is about 67%

4. Simulation Results

- To simulate the behaviour of fluid in a channel Comsol is used

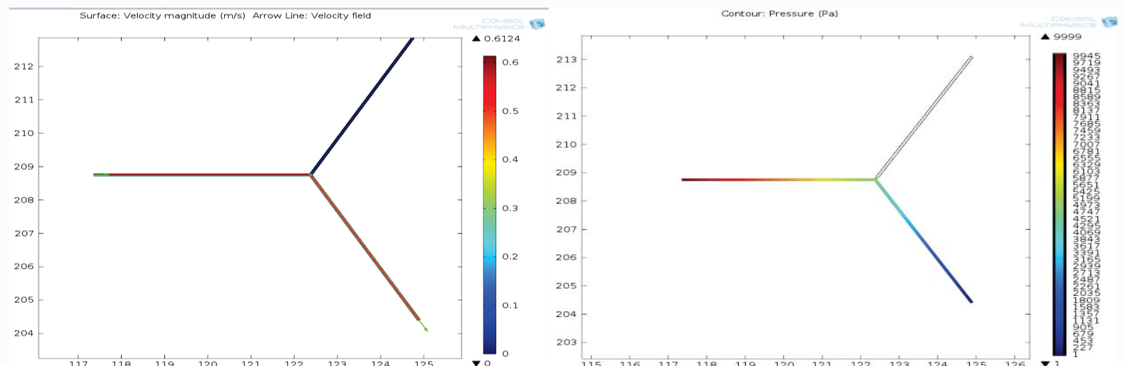

Figure: C: Velocity Figure: D: Pressure Distribution in Y Shaped channel

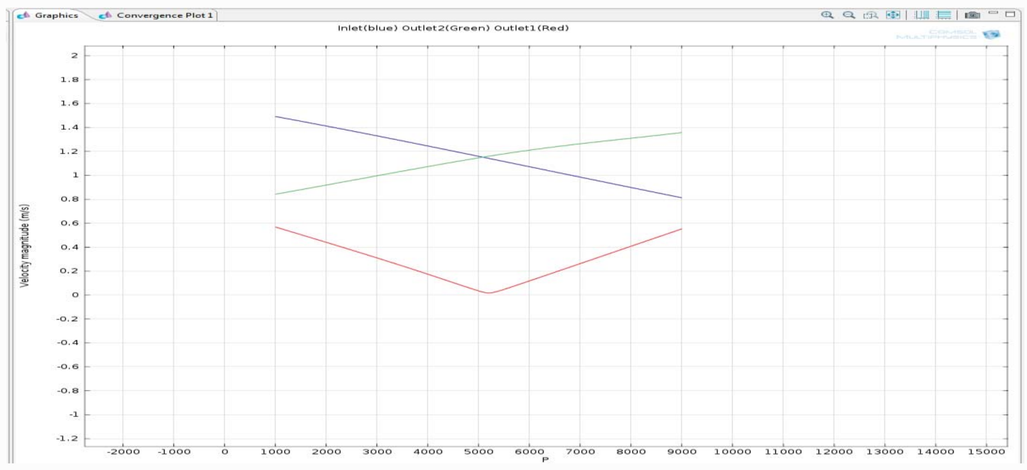

Figure: D: Velocity Vs Pressure

5.Conclusions

- A Y-shaped channel is simulated for the optimum numerical pressure variations such that velocity variations in practice is feasible for sorting.
- This allows the device to screen C.elegans based on their optical properties without the help of a microscope, an image tracking algorithm and a computer.

5.References

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