

# Visualization Tool for Flow Cytometry Data Standards Project

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in collaboration with  
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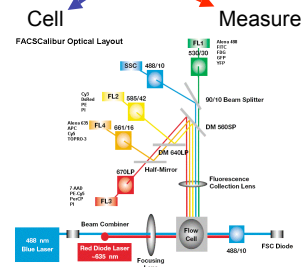
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## Today

- Flow Cytometry (reminder)
  - Dataset description
- Goals
- Previous work
- FlowCytoVis prototype in details
- Data analysis comparison
  - FlowJo vs FlowCytoVis prototype
- Demo!
- Conclusions and future work

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## Flow Cytometry (FCM)

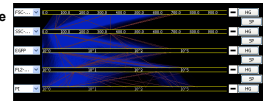


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## Dataset Properties

Typically for research at the TFL:

- 100,000+ events
- 5-10 dimensions



Capability:

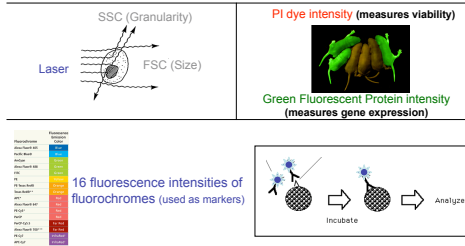
- 1,000,000 events (cells going through the laser beam) per dataset
- Up to 20 dimensions

Today demo datasets:

- 20,000 events
- 5 dimensions

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## Dimensions



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## Aimed Goals

User requirements (based on user studies):

- See all dimensions at once
- Improve analysis sequence
- Leave scatterplots and histograms
- Gating/Filtering feature
- Provide better usability than commercial FlowJo

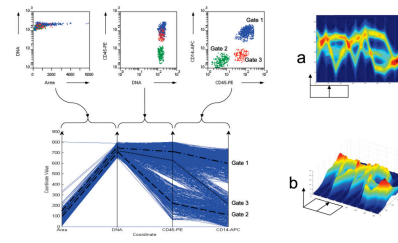
By means of:

- Using Parallel Coordinates with Gating/Filtering
- Implementing data clustering throughout dimensions
- Include scatterplots and histograms in the interface
- Make effective, convenient and interactive interface

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## 3D Parallel Coordinate System for FCM

Marc Streit et al. (2006)



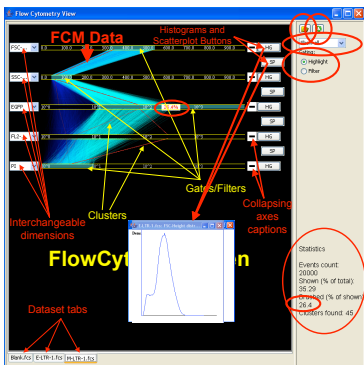
Picture from Marc Streit et al. (2006)

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## 3D Parallel Coordinate Problems

- Does not provide any new information about dataset
- Introduces visual occlusions
- Necessity to rotate to see all data

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## Aimed Goals

User requirements (based on user studies):

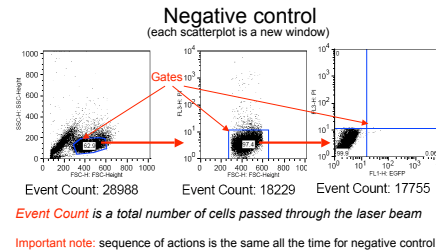
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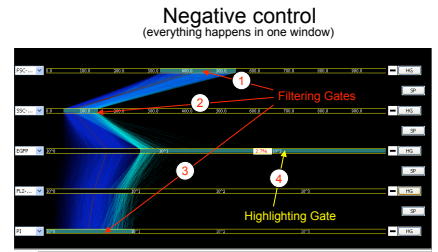
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## Data Analysis Process (FlowJo)



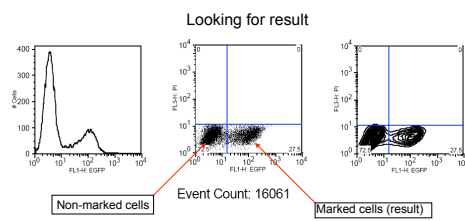
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## Data Analysis Process (FlowCytoVis)



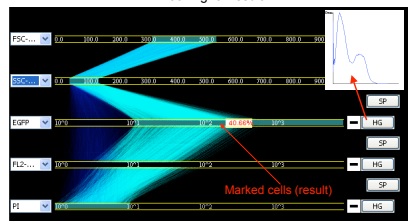
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## Data Analysis Process (FlowJo)



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## Data Analysis Process (FlowCytoVis)



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## Demo

Implementation details:

- Java2D + Swing
- CFCS library for reading .fcs (FCM datasets) format

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## Strengths and Weaknesses of the FlowCytoVis

- + Can provide insights into the data
- + Convenient (less clicks to get the same result)
- + Interactive
- + Allows intuitive multidimensional filtering
- + Visually appealing
- Slow picture rendering relatively to Scatterplots
- At the moment does not provide full functionality that FlowJo provides.

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## Conclusions

- The FlowCytoVis proved to be a relevant solution for the Flow Cytometry data visualization and was accepted with enthusiasm
- Parallel Coordinates (PC) view is a nice addition to canonical Scatter Plots for Flow Cytometry
- Clustering works very well together with PC and can save some rendering time
- Clustering needs refinement and improvement
- Improving speed is vital for PC

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## Future Work

- Implement all the functionality still missing
- Integrate existing clustering made for the Flow Cytometry Data Standards Project into the FlowCytoVis
- Improve rendering speed for parallel coordinates

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## Acknowledgements

- Dr. Tamara Munzner
- Dr. Ryan Brinkman
- Dr. Josef Spidlen
- Dr. Louie van de Lagemaat
- Irina Maksakova
- Other TFL Members

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## Questions...

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