

X3D DATA DRIVEN VISUALIZATION

12-15, August, 2018
Web3D Consortium, SIGGRAPH



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Introduction

- Big Data Generation

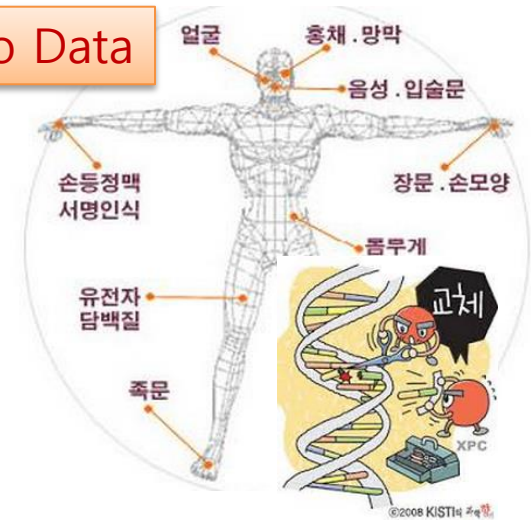
Business Data



Social Data



Bio Data



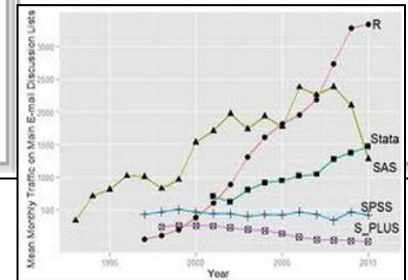
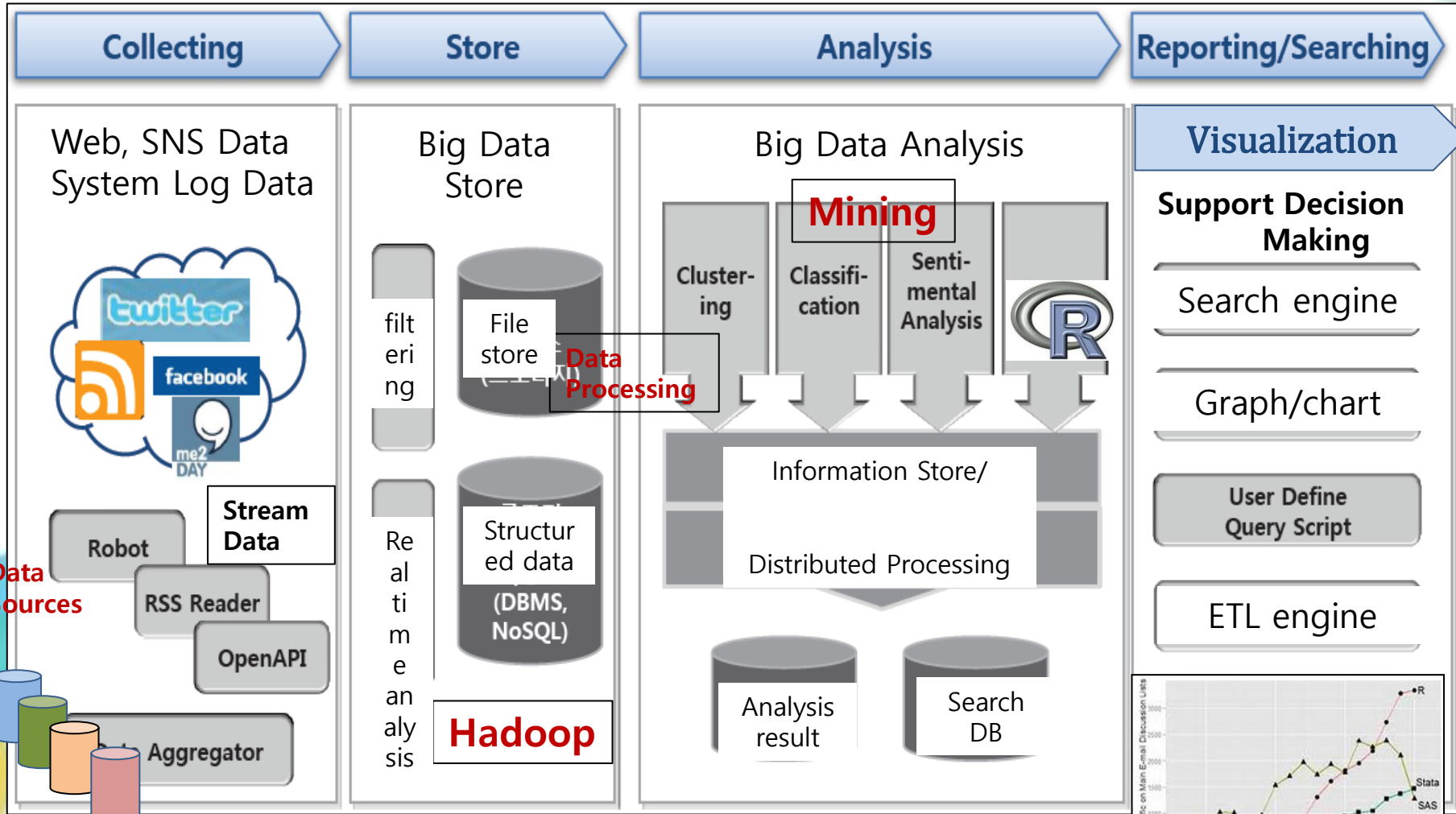
Video -CCD Camera



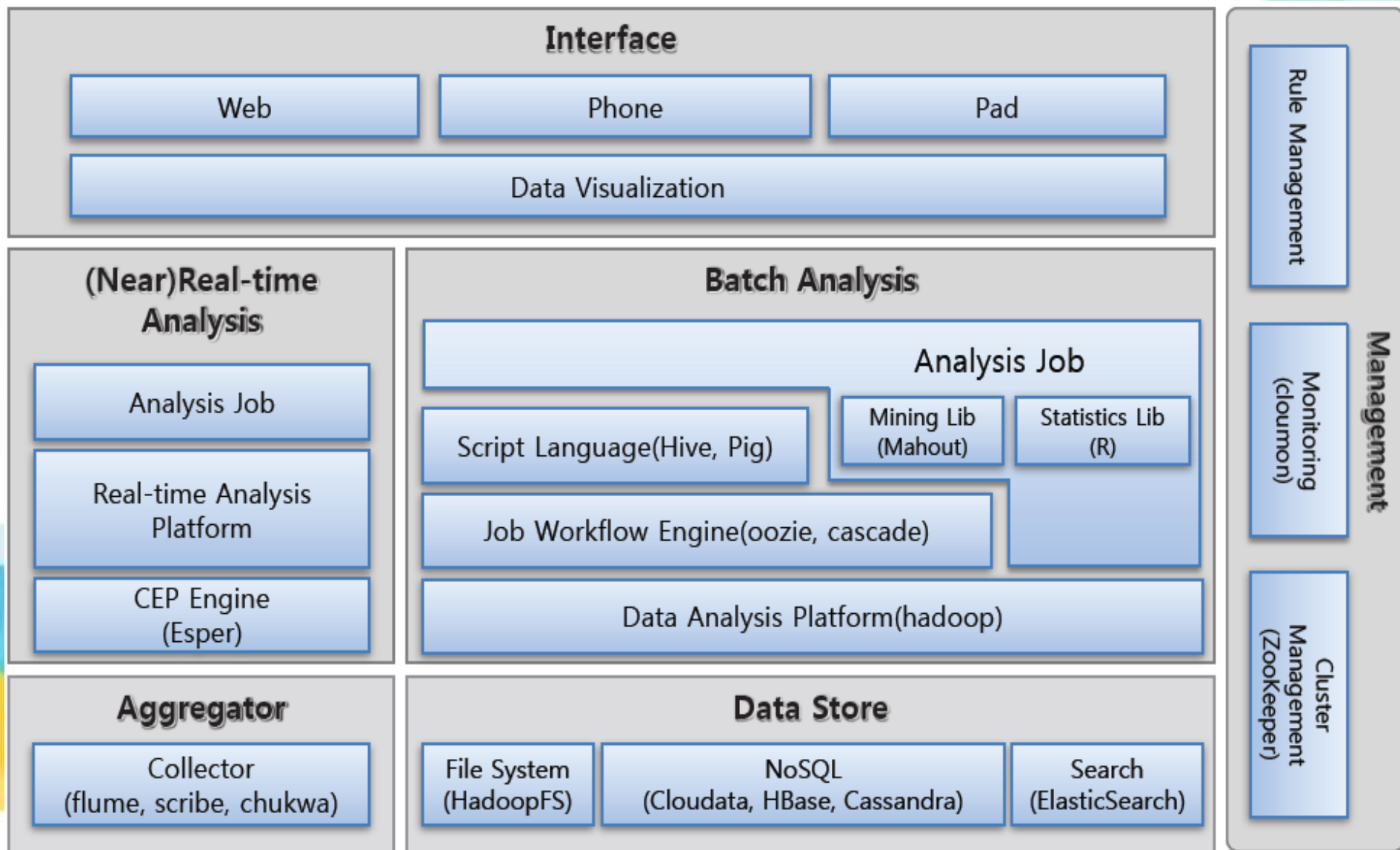
IoT / M2M Geospatial Data



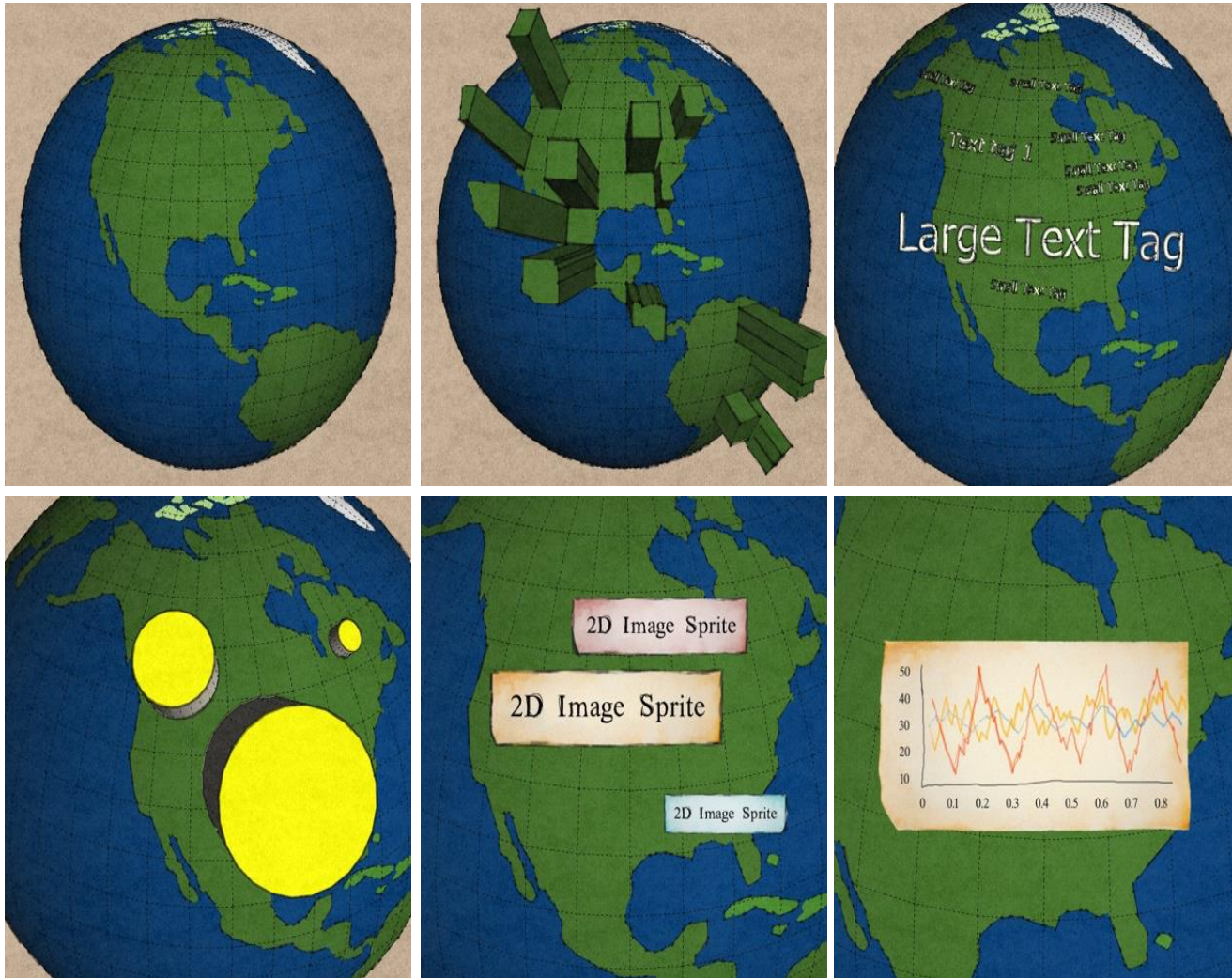
Data Life Cycle



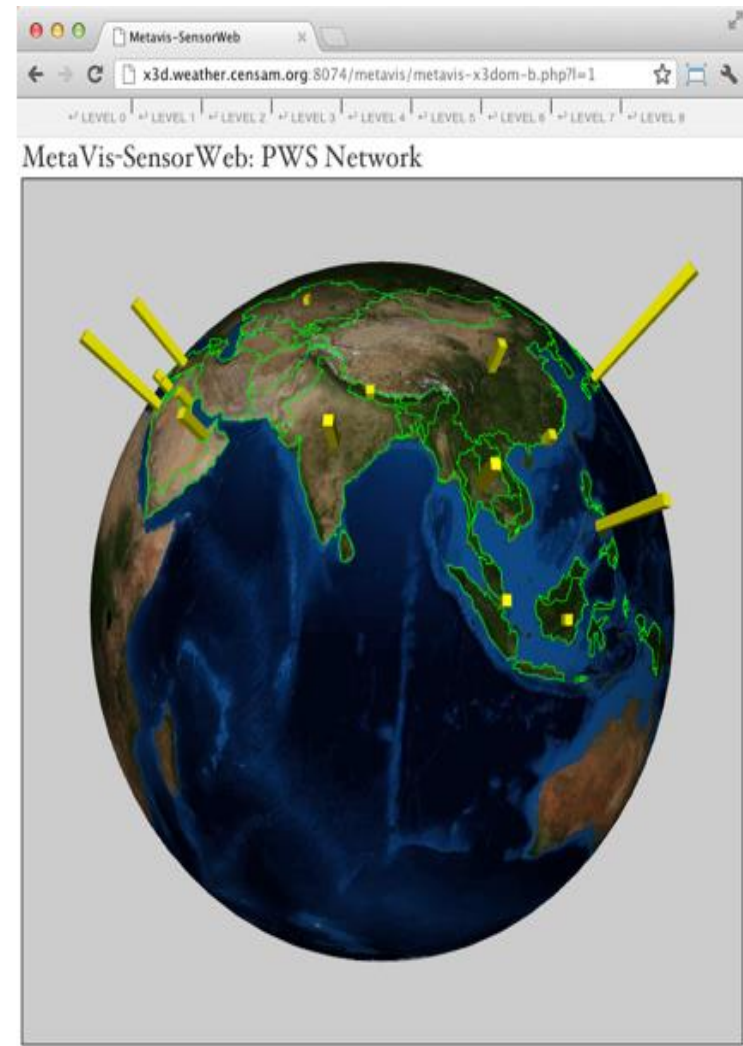
Big Data Processing System



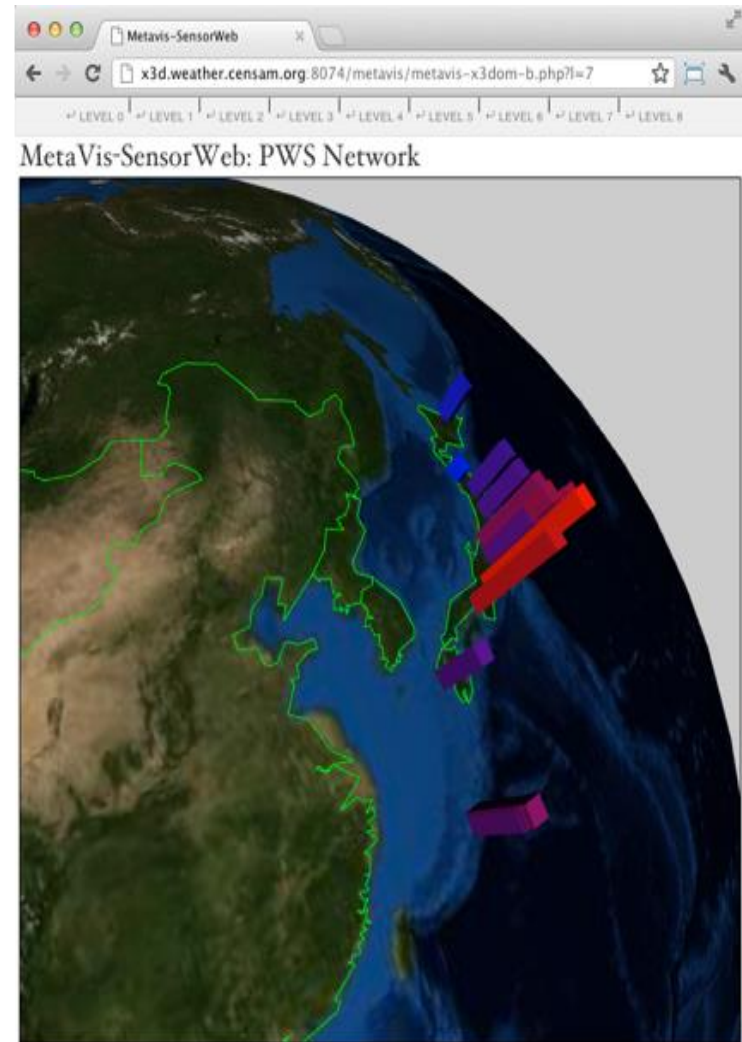
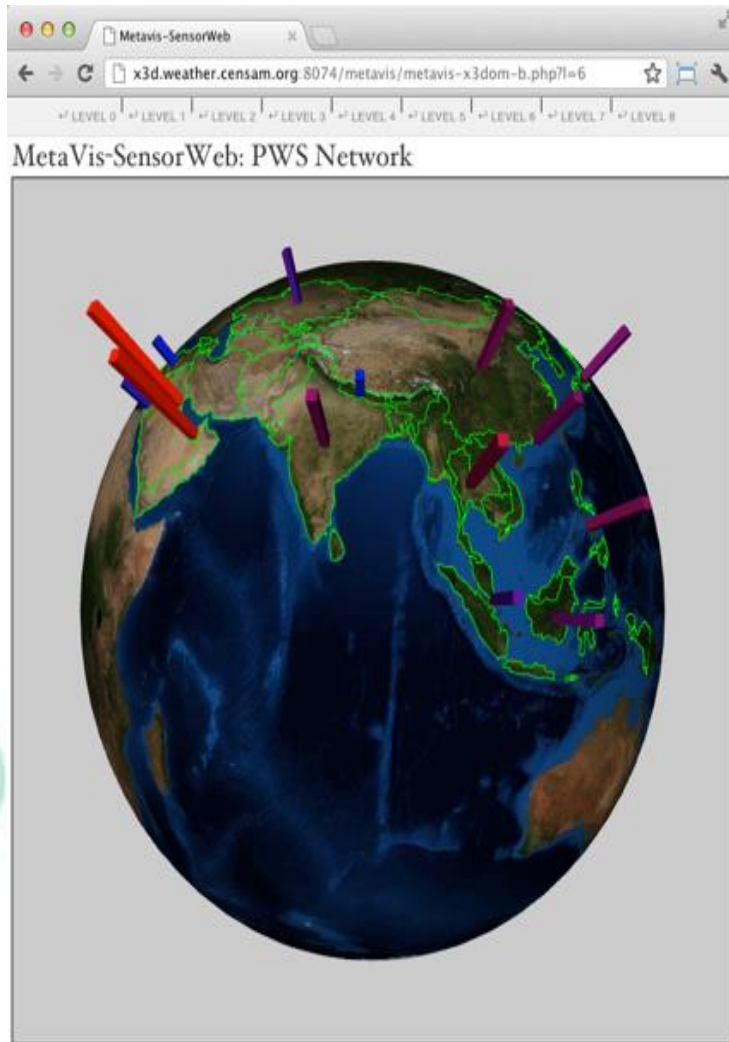
Visualization template design



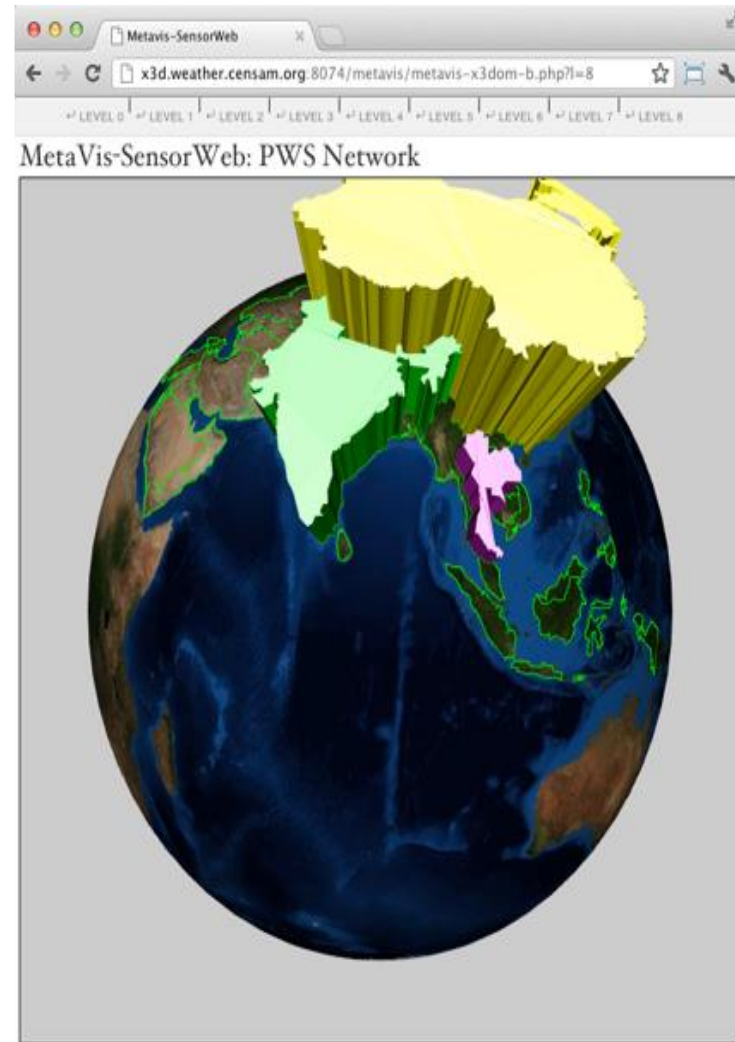
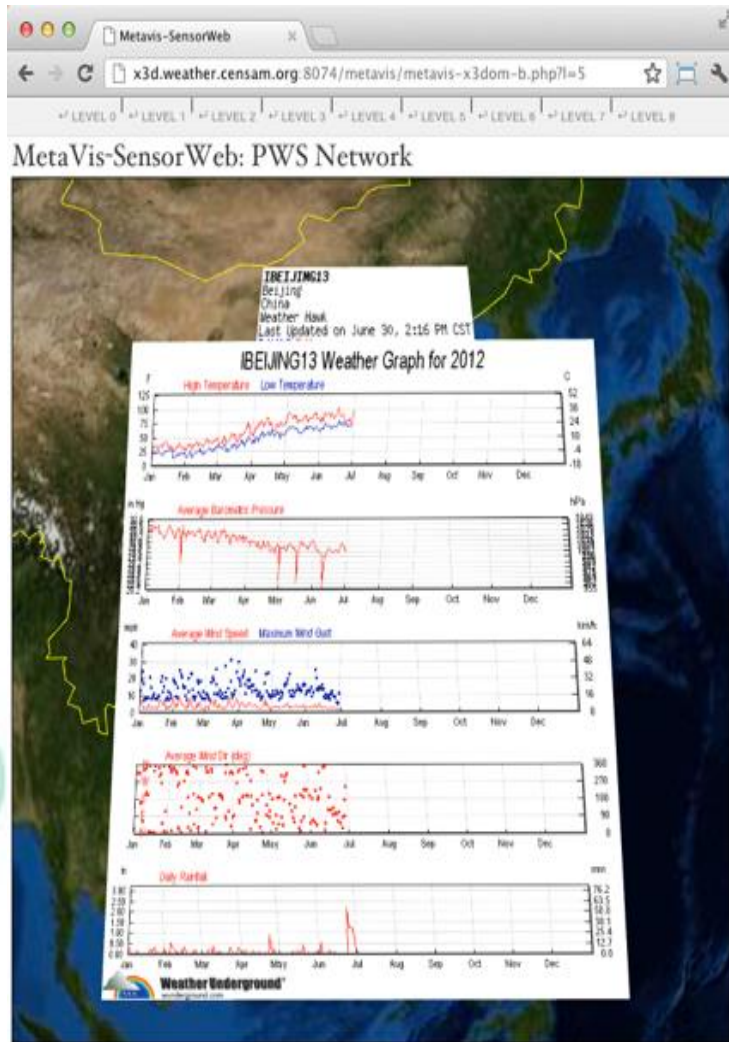
HTML5/X3D integration



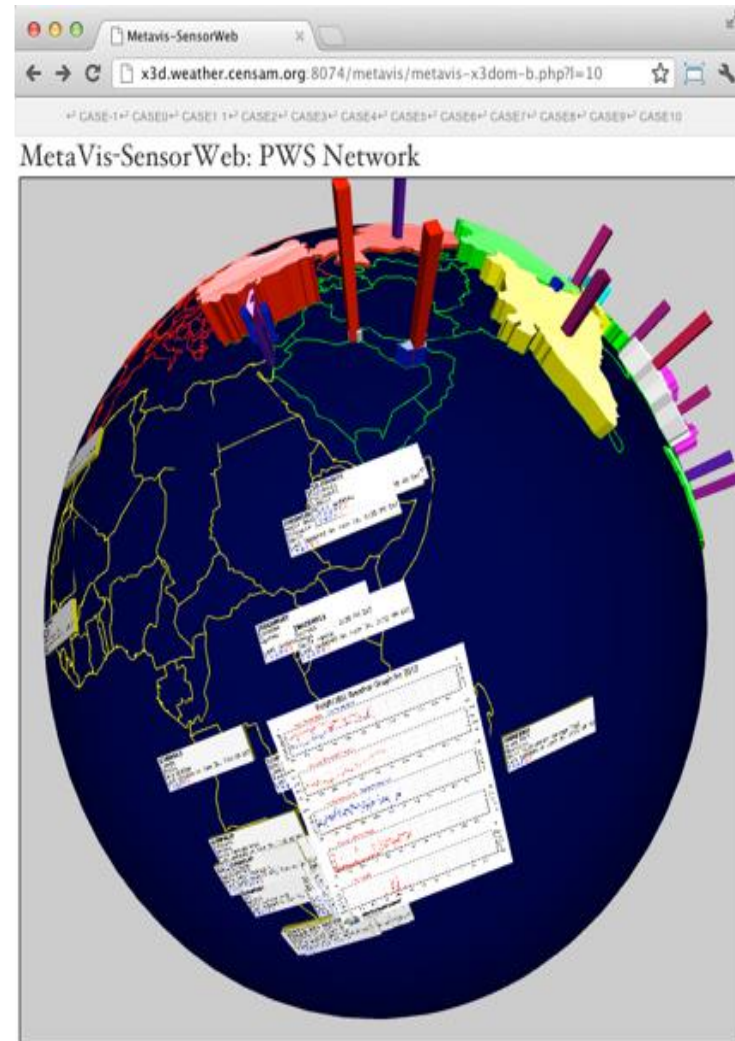
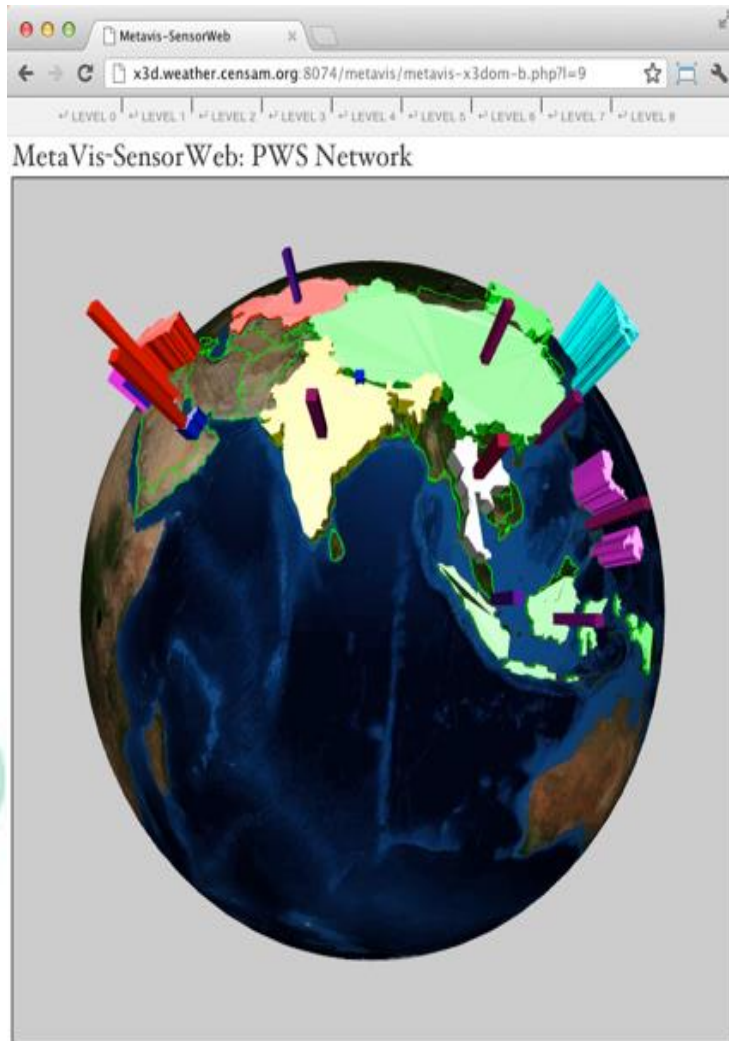
Geospatial mashups



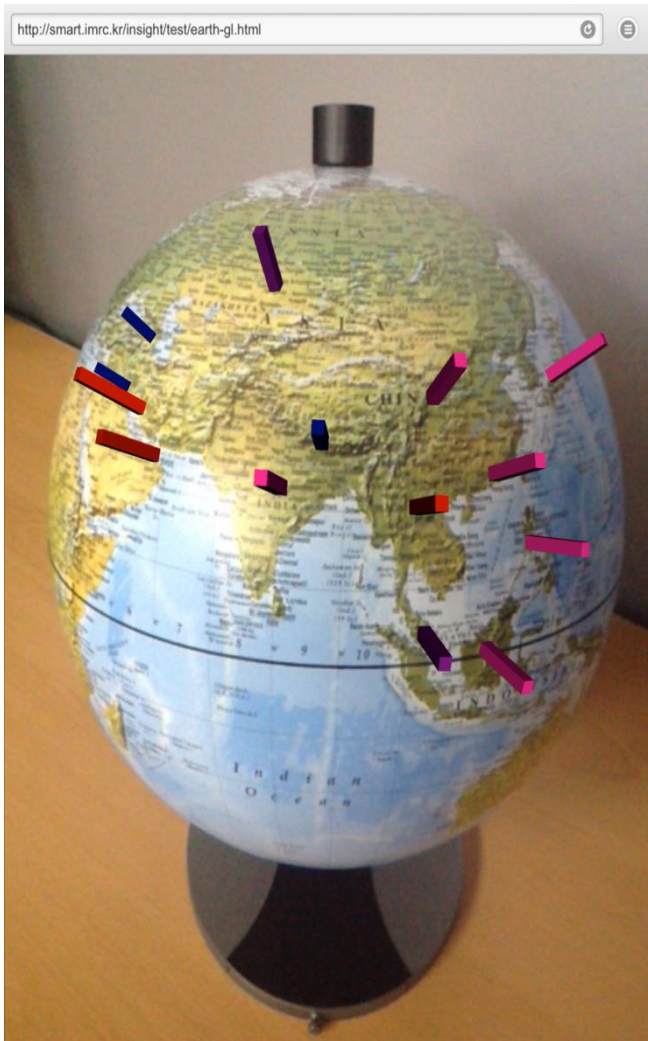
Spatiotemporal visualization



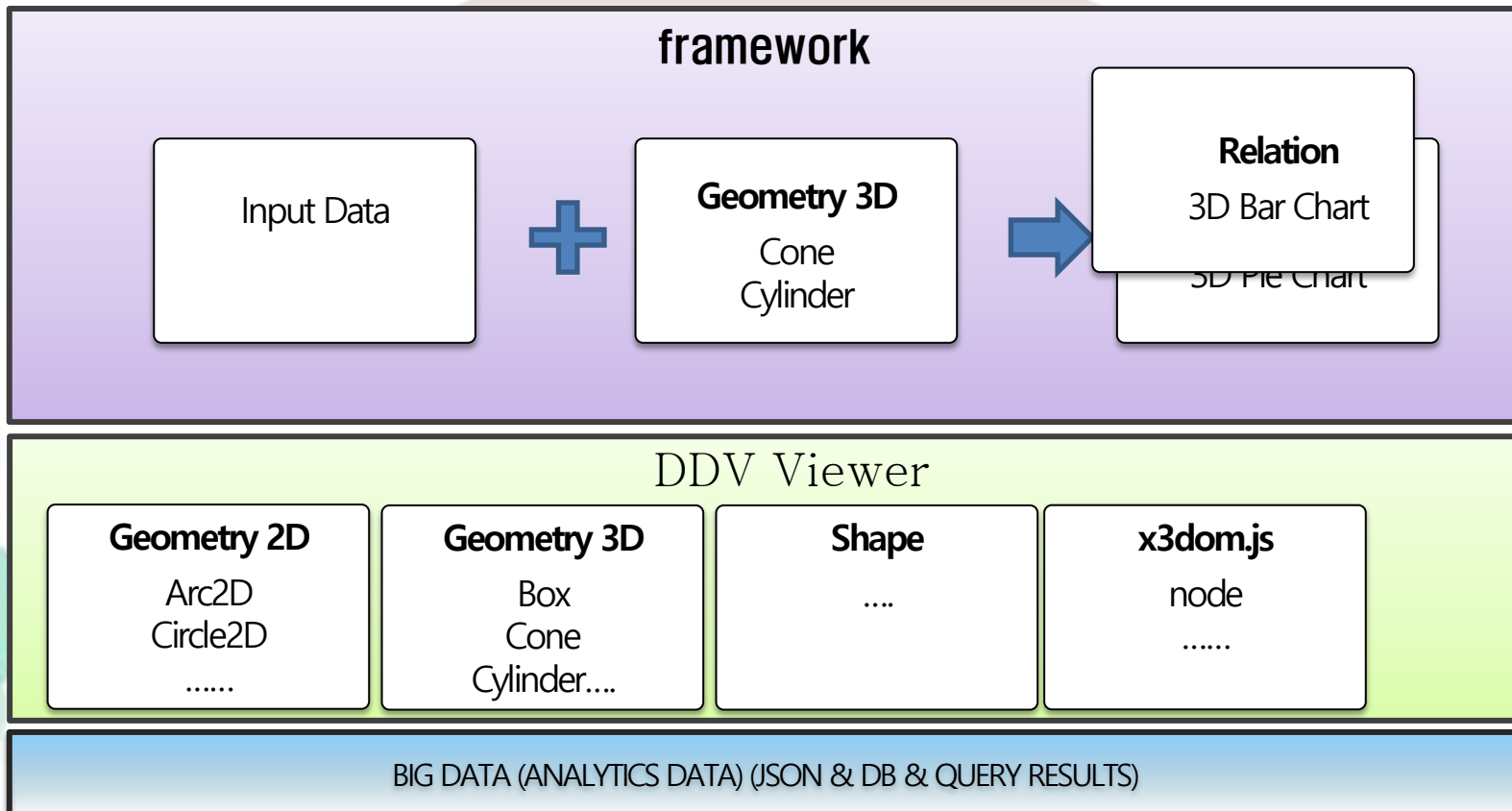
Data-driven visualization



Mixed and Augmented Reality



Data Driven Visualization



Data Driven Visualization (DDV)

Big Data Visualization Primitive

Time series

Bar Graph
Stacked Bar Graph
Time series Graph

Distribution

Pie Chart
Donut Chart
Tree map

Comparison

Scattered Graph
Bubble chart
Histogram

Correlation

Hit map
Chernoff Face
Star Chart

GeoSpatial

Map mapping
Choropleth map

Visualization library

Data source

Database

csv, tsv, txt

json

html

■ 3D Components

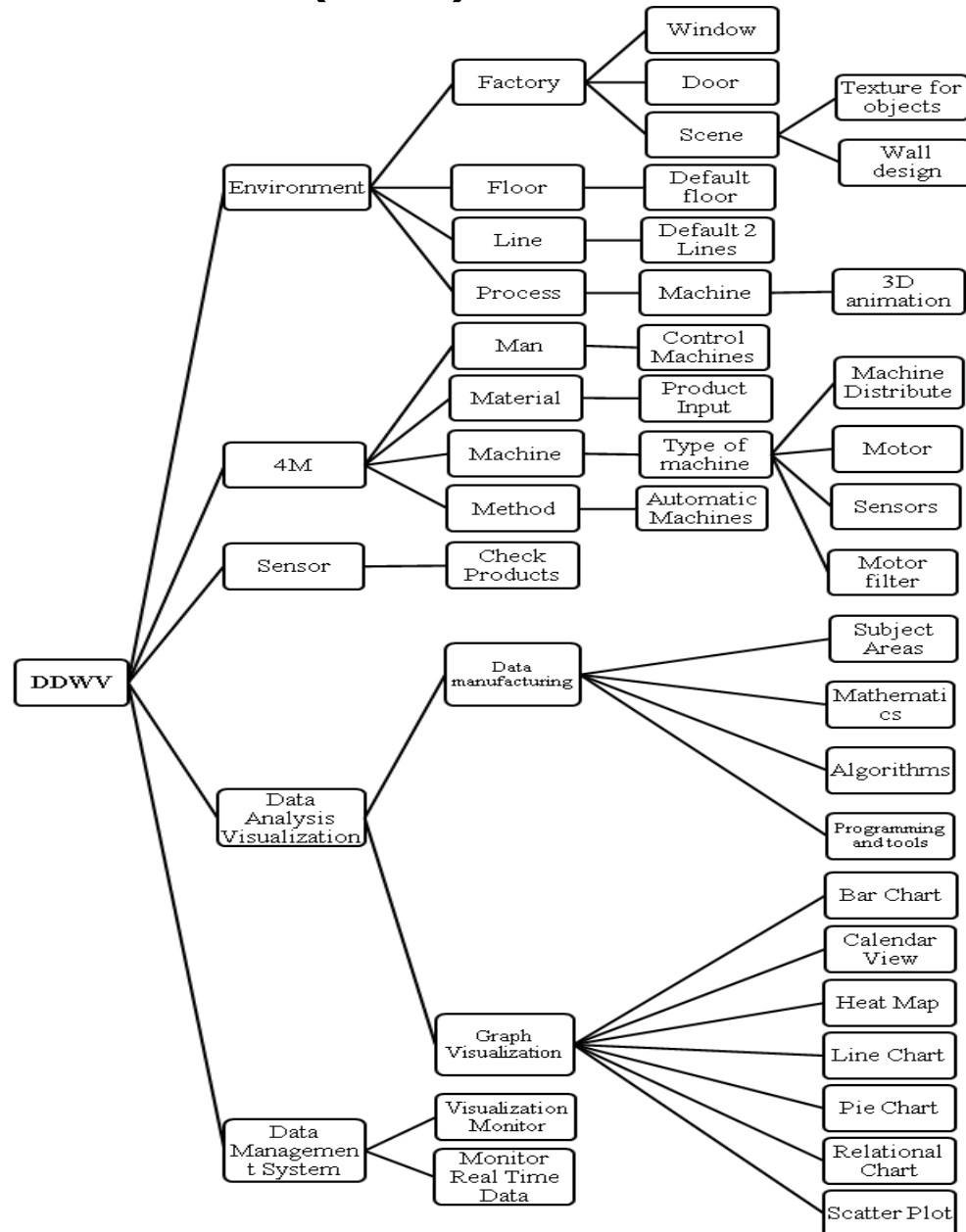
Class	Detail
3D Components	3D Treemap
	3D Tree
	3D Pack
	3D Partition
	3D Force
	3D Bundle
	3D Chord
	3D Cluster
	3D Stack
	3D Hierarchy

3D Graph
3D accumulation stick graph
3D Point Graph
3D Time Series Graph
3D Stage Graph
3D Pie Chart
3D Donut Chart
3D accumulation stick graph
3D accumulation continuous graph
3D Scatter Plot
3D Bubble Chart
3D Histogram
3D Density Graph
3D Heatmap
3D Chernoff Face
3D Star Chart
Various Visualization on 3D Map
Charts on 3D Map

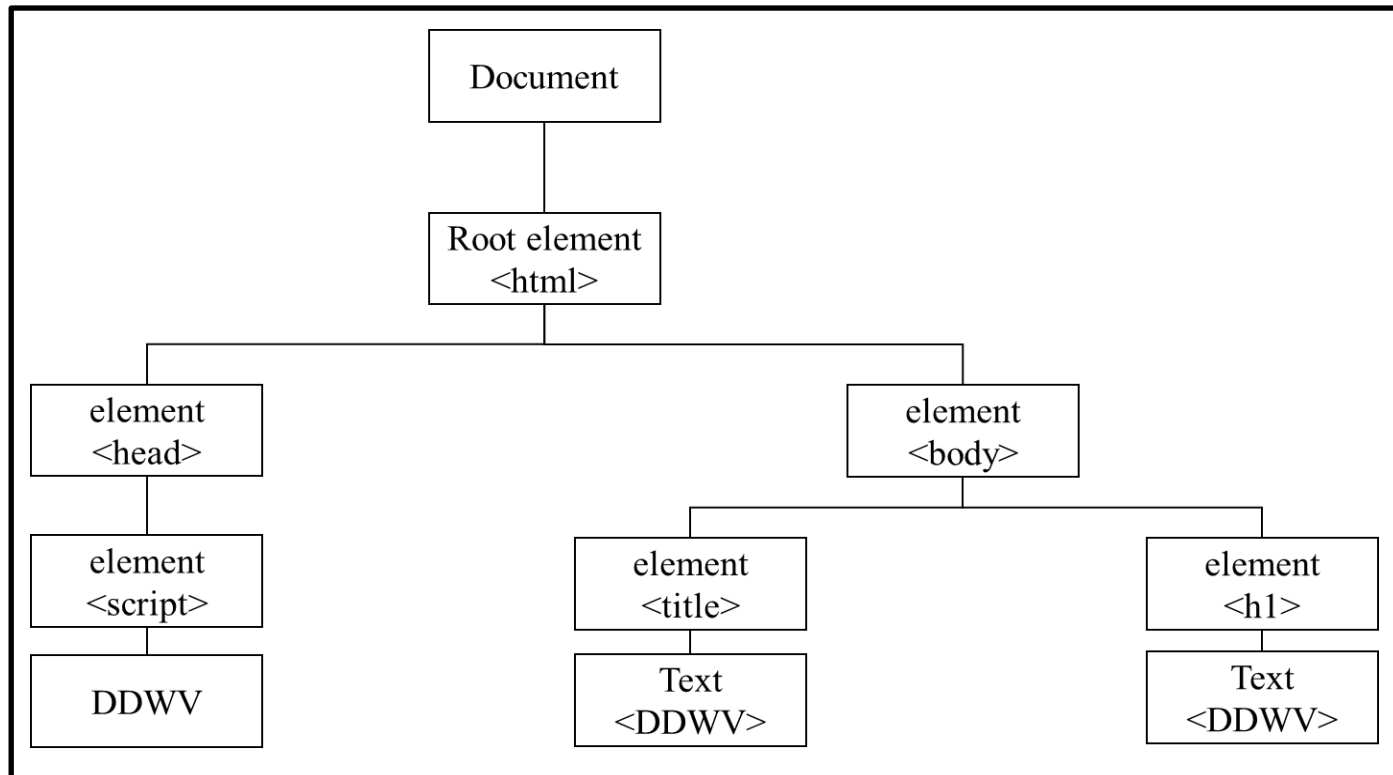
CONTENTS

Class	Description
DDVTimeseries	3D Graph
	3D accumulation stick graph
	3D Point Graph
	3D Time Series Graph
	3D Stage Graph
DDVDistribution	3D Pie Chart
	3D Donut Chart
	3D accumulation stick graph
	3D Tree map
	3D accumulation continuous graph
DDVRelation	3D Scatter Plot
	3D Bubble Chart
	3D Histogram
	3D Density Graph
DDVComparison	3D Heatmap
	3D Chernoff Face
	3D Star Chart
	3D parallel coordinates
DDVSpatial	Various Visualization on 3D Map
	Charts on 3D Map

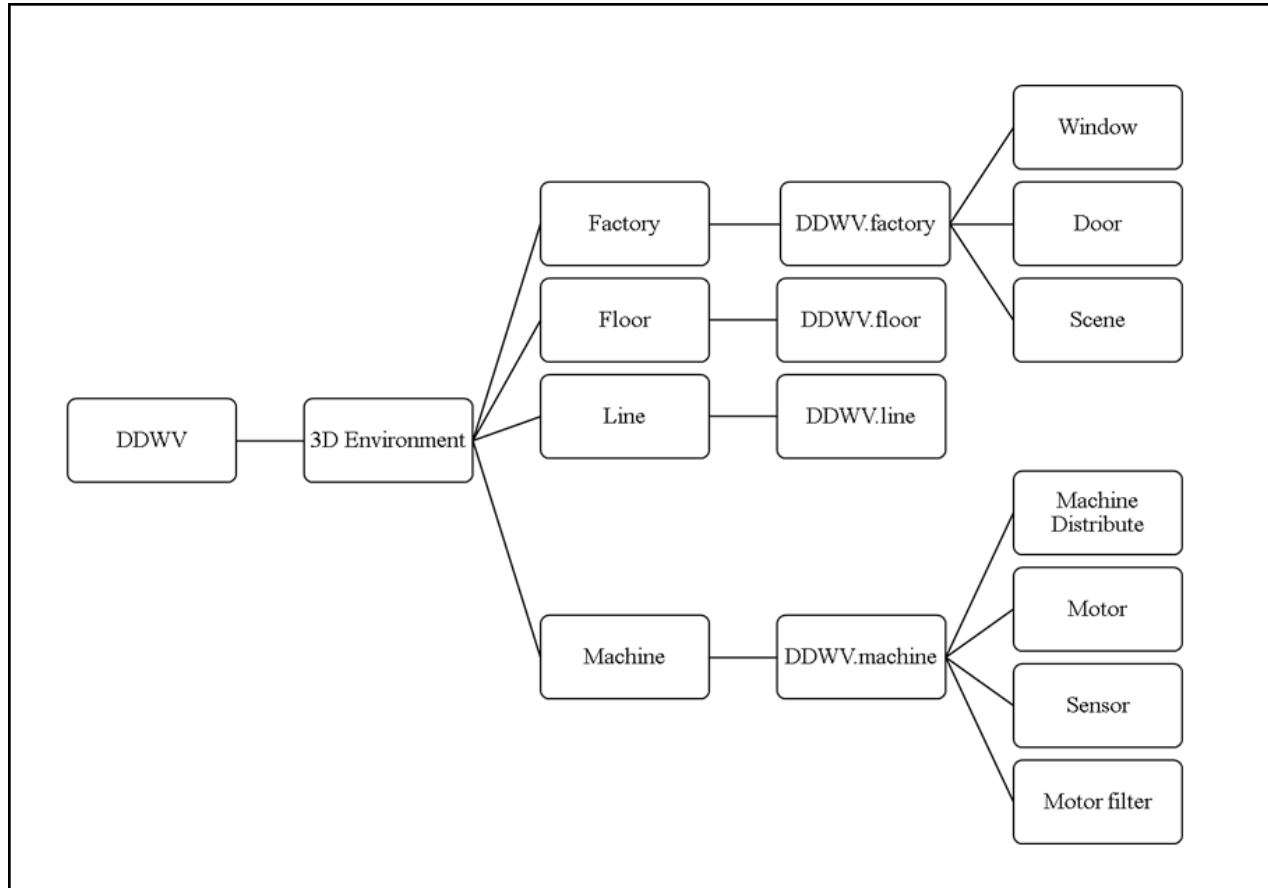
Data Driven Visualization (DDV)



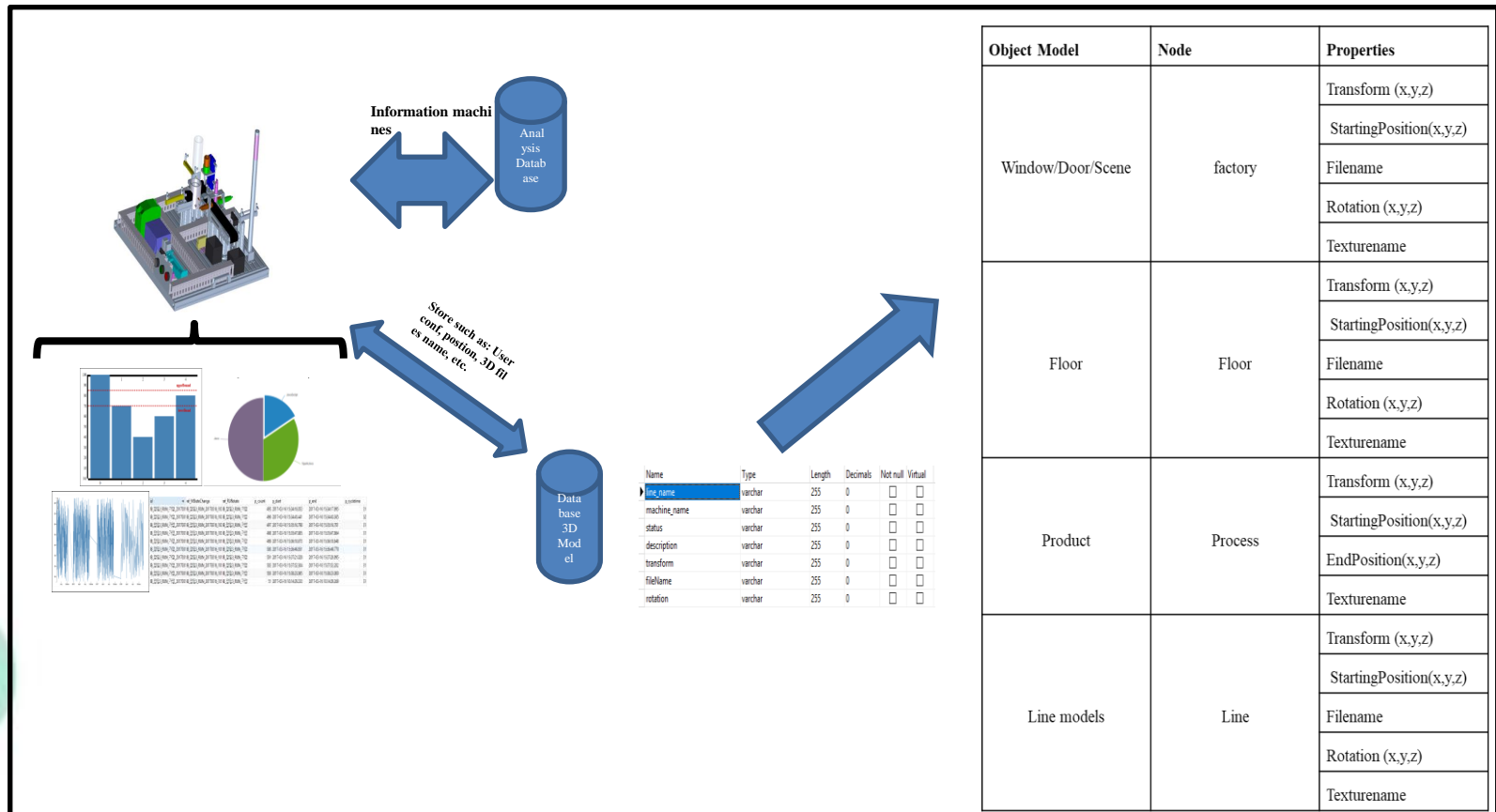
DDV Structure with HTML



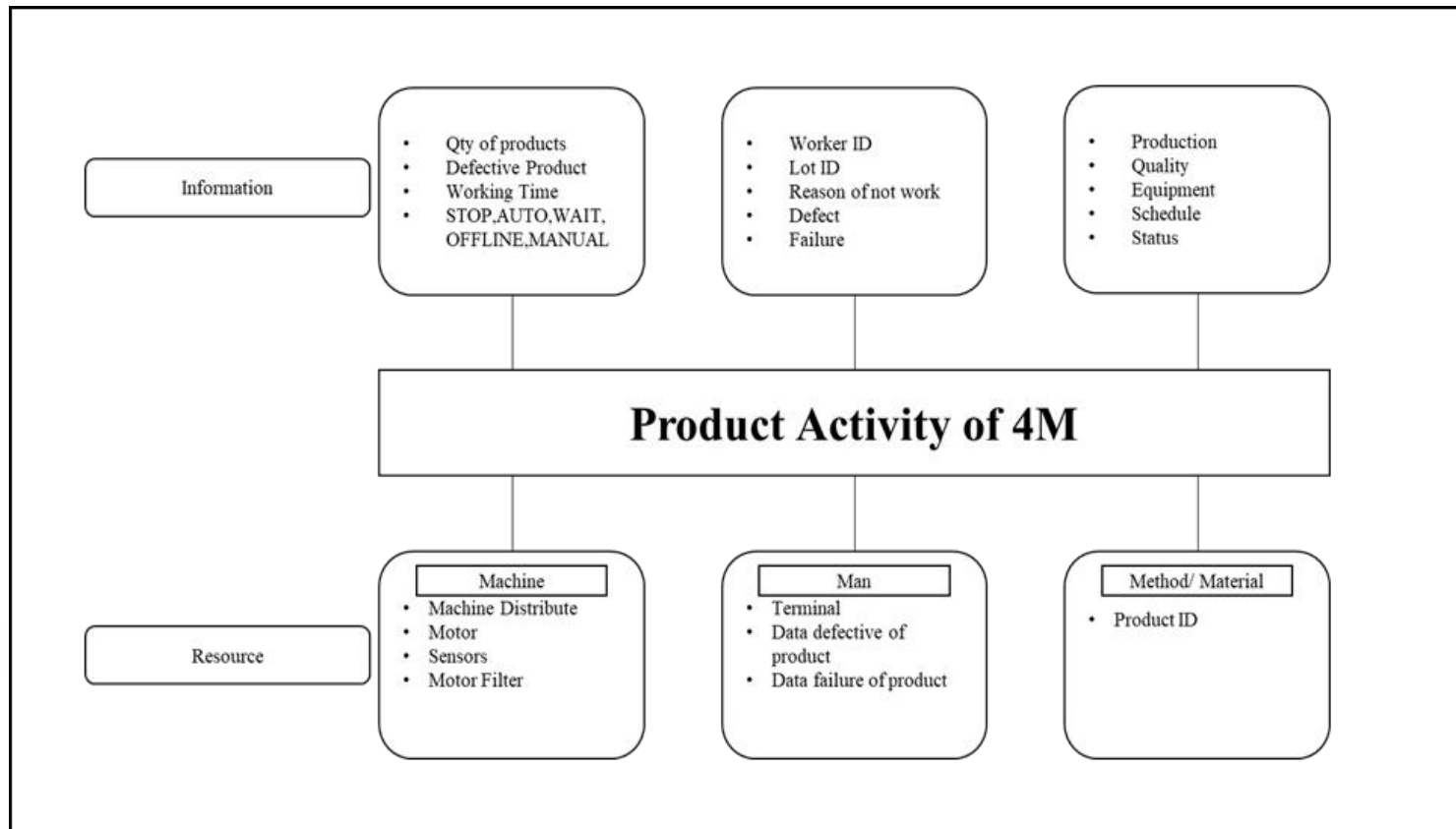
DDV Environment Representation



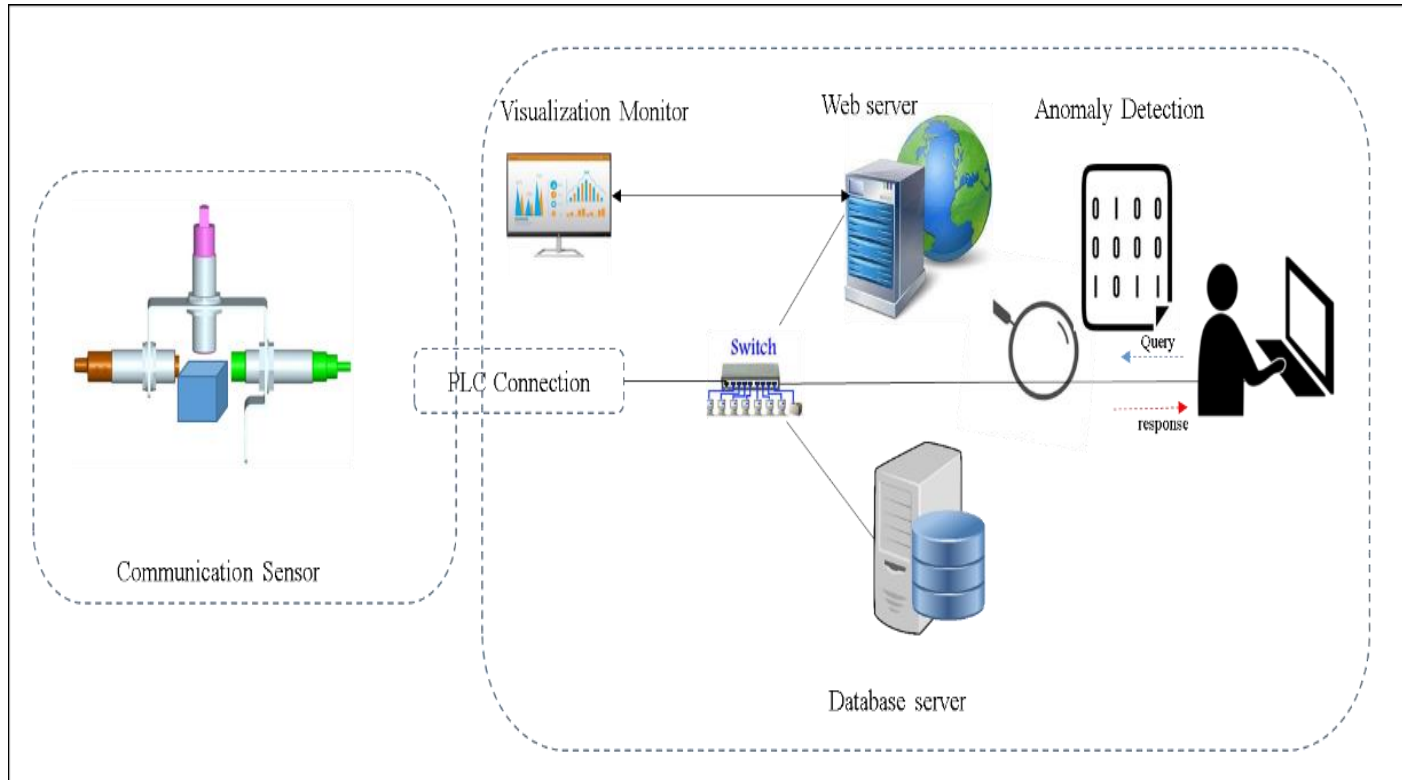
DDV Environment Representation



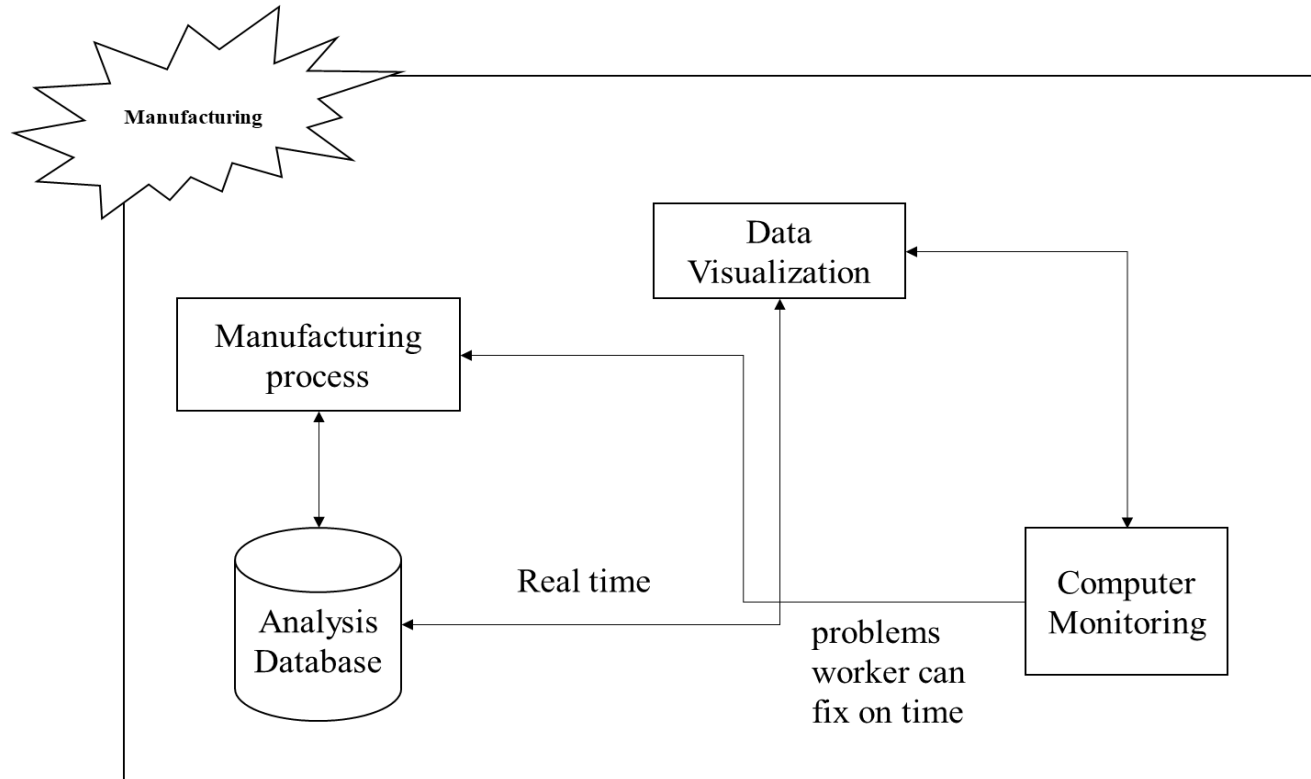
DDV – 4M Representation



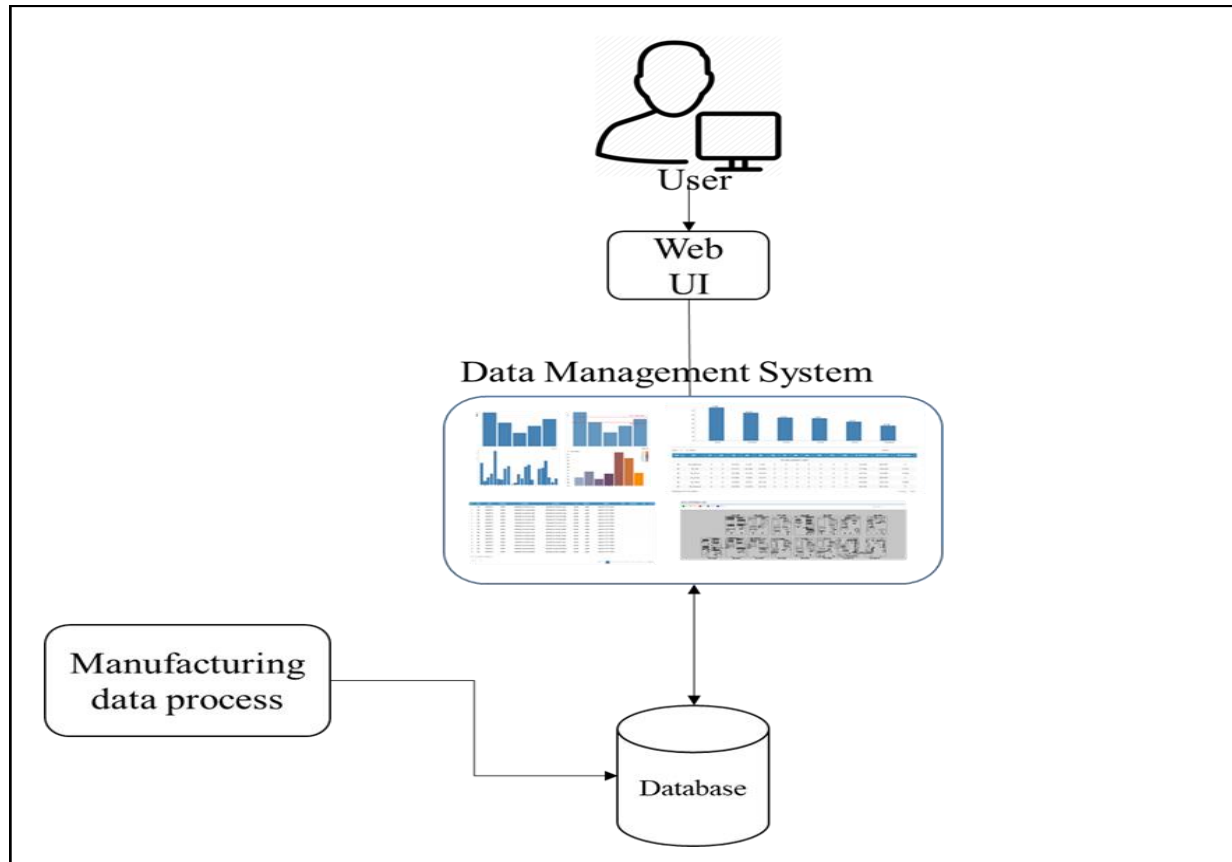
DDV – Sensor Representation



DDV Data Analysis Visualization

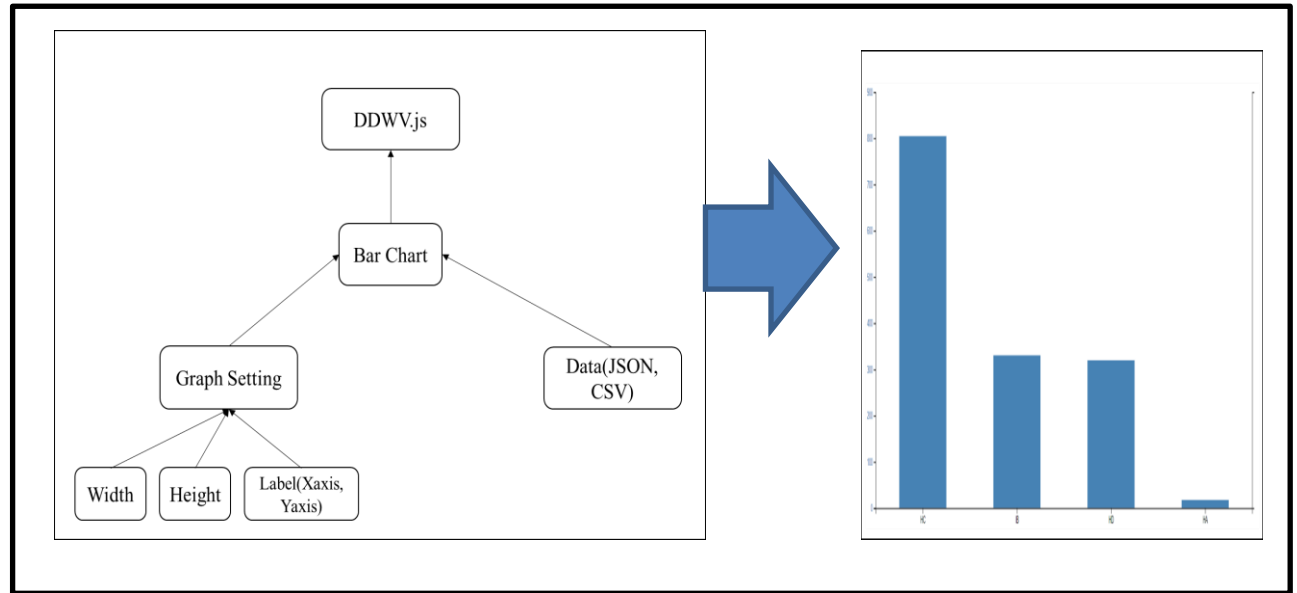


DDV Data Management

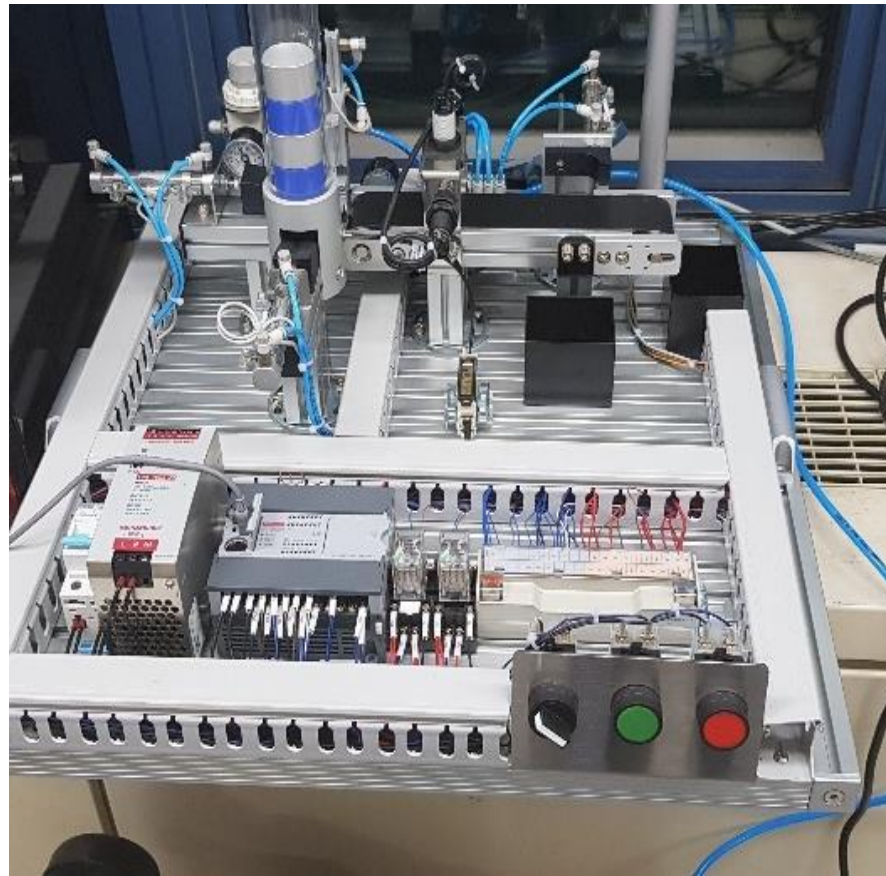


Experimental Results

```
<script>
var data = [
  {num_sent: 0, perc: '100'},
  {num_sent: 1, perc: '70'},
  {num_sent: 2, perc: '40'},
  {num_sent: 3, perc: '60'},
  {num_sent: 4, perc: '80'}
];
DDWV.barChart({
  selector: "#bar-chart",
  data: data,
  width: 700,
  height: 400,
  yAxisLabel: 'CGAC_Y',
  xAxisLabel: "CGAC_X",
  dimensionName: 'num_sent',
  onClick: function (d, i, el) {
  }
})
</script>
```

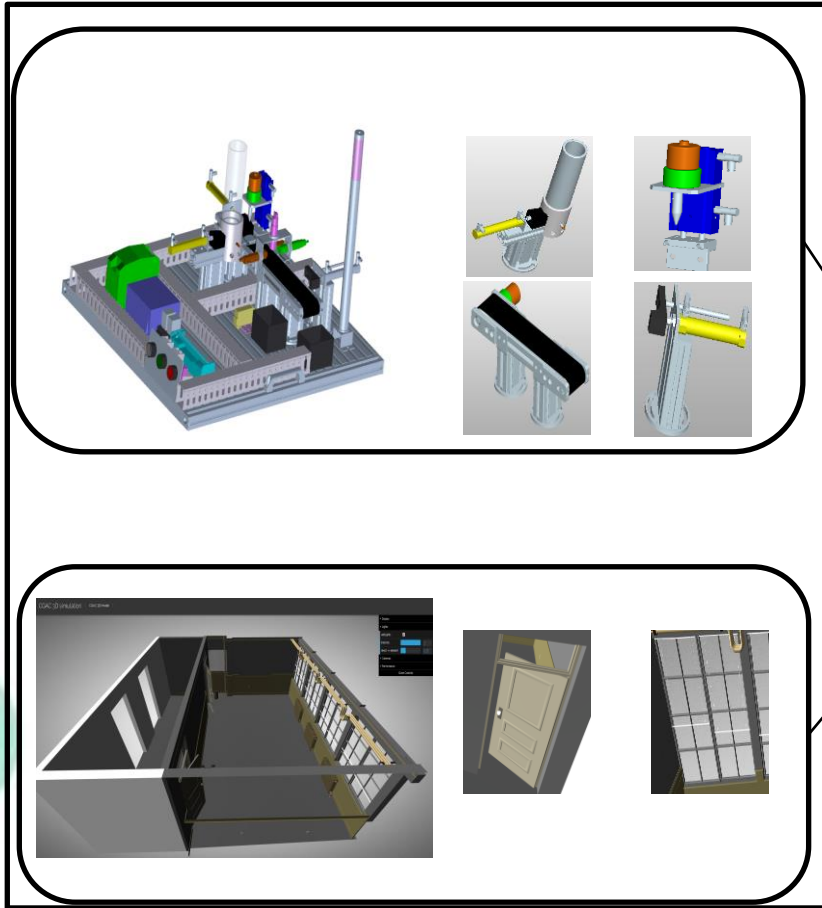


Experimental Results



Physical Object Simulation

Experimental Results



```
<!DOCTYPE html>
<html lang="en">
<head>
  <meta charset="UTF-8">
  <title>3D manufacturing Environment</title>
</head>
<body>
<ddwv>
  <environment>
    <factory>
      //Window
      <window src="../../user/manufacturing/window.obj">
    </window>
    <door src="../../user/manufacturing/door.obj">
    </door>
    <door src="../../user/manufacturing/scene.obj">
    </door>
    </factory>
    <floor src="../../user/manufacturing/floor.obj">
    </floor>
    <line src="../../user/manufacturing/line.obj">
    </line>
    <process src="../../user/manufacturing/machines.obj">
    </process>
  </environment>
</ddwv>
</body>
</html>
```

Experimental Results



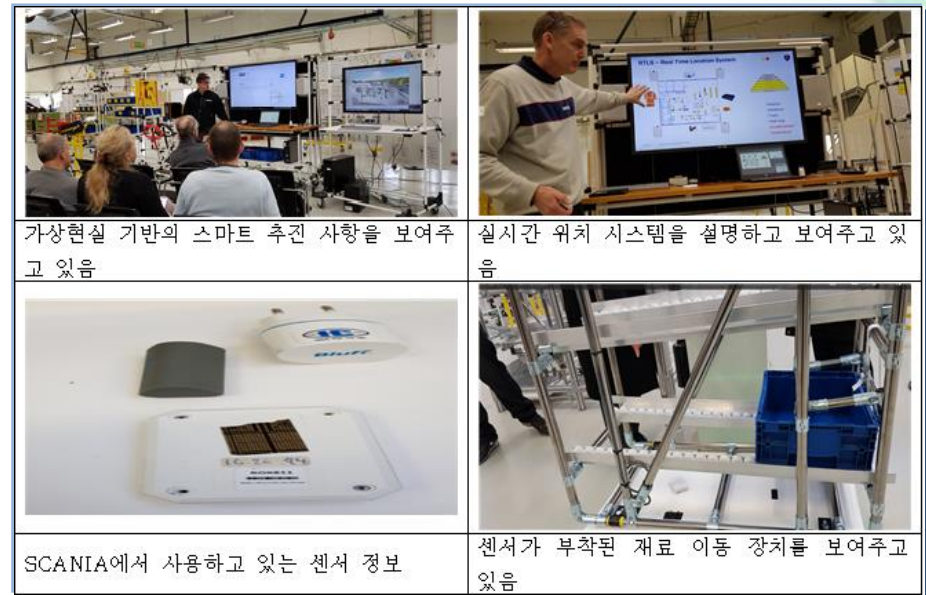
DDV Future

- Design Database(Store 3D Object information)
- Data gathering(apply into 3D manufacturing animation)
- Remake layout and default model Object(When startup program)
- Animation (When products or machines have problem alert message)
- Live data (Label) on each machines
- Apply 3D visualization (3D Bar chart, 3D Histogram)
- Add functions(Environment, Machine, Material, Man, Method, Sensor)
- Design hand robot (Pressure1,2,3 ...)
- Update UI authoring tool
- Users select specific location in scene and than add 3D object

Applications of DDV



Samsung Smart Factory



Sensor based movement

Digital Twin System

Digital Twin System

- Digital Twin System: Cyber Physical System
 - Data Gathering: IoT/Sensor Representation
 - Data Store: Big Data System
 - Data Analysis: Data Mining, Artificial Intelligence
 - Data (Analysis) Visualization: AR, VR, Computer Graphics
 - Network: Real time data transmission
 - Security: Data Encryption/Description
 - Training: Virtual Training



Thank You!