



Matlab and Simulink Creation and Animation of X3D Graphics in Web-Based Simulation

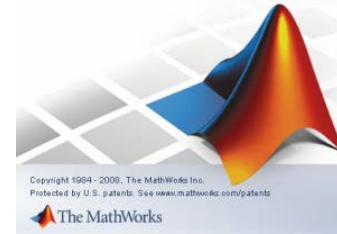
YuanPin Cheng and Don Brutzman

**Modeling, Virtual Environments, Simulation (MOVES)
Institute, Naval Postgraduate School**

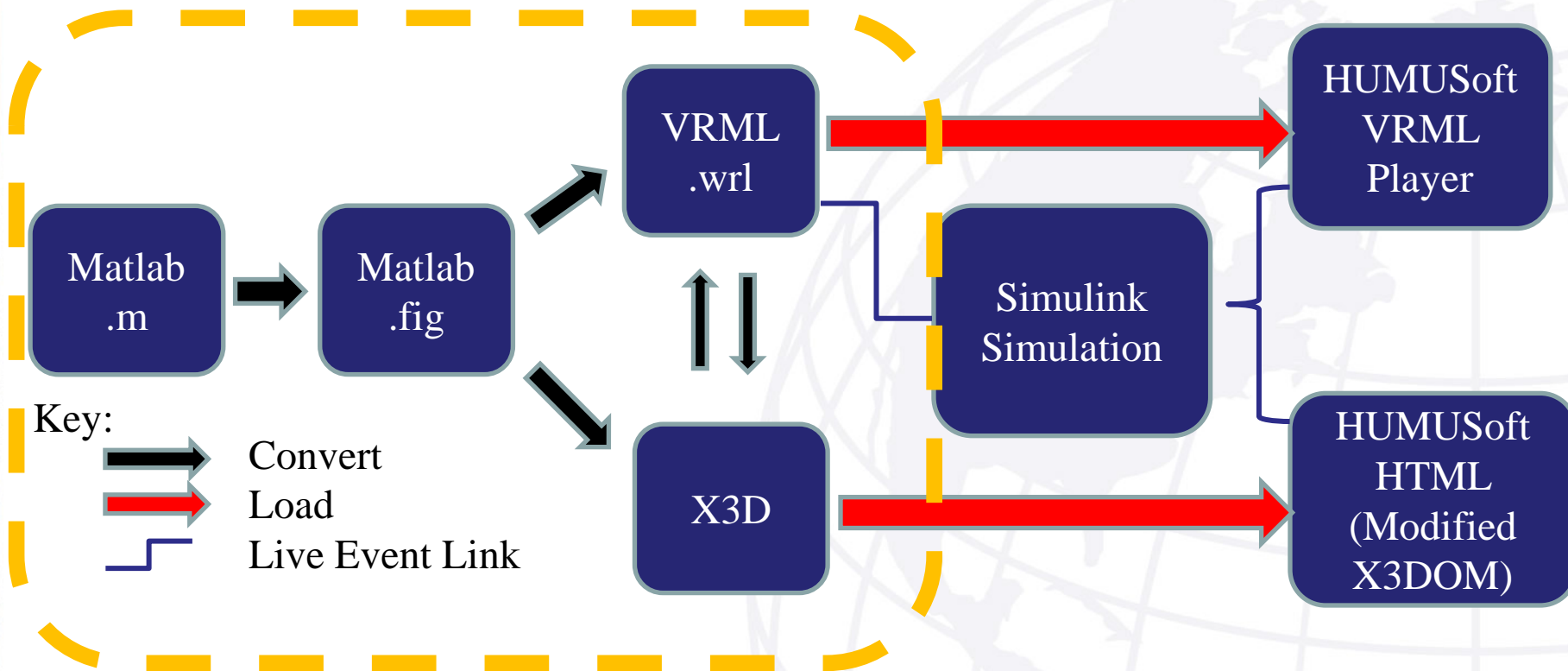
20 June 2015

- Matlab - A powerful tool to compute high-fidelity engineering model and plot the result in figures.
- Simulink - Implemented .m code into block diagrams and flow charts to execute the simulation.
- X3D – Web-Based 3D model object so we can apply it into web-based animation in future work.
- X3DOM -(pronounced X-Freedom) is an open-source framework and runtime for 3D graphics on the Web

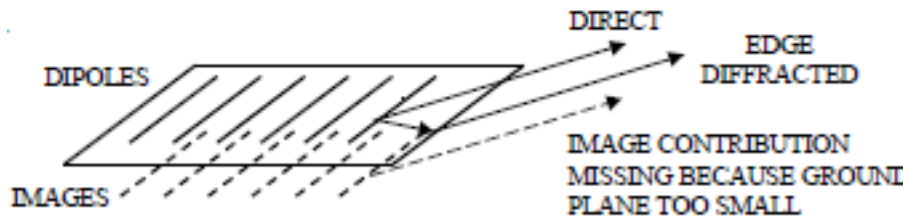
MATLAB®
The Language of Technical Computing



- Matlab and Simulink to Web-Based Simulation Application Flow Chart

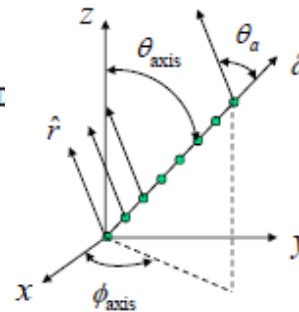


- Phased Array Antenna Model



$$\hat{r} = (\hat{x} \sin \theta \cos \phi + \hat{y} \sin \theta \sin \phi + \hat{z} \cos \theta)$$

$$\hat{a} = (\hat{x} \sin \theta_{axis} \cos \phi_{axis} + \hat{y} \sin \theta_{axis} \sin \phi_{axis} + \hat{z} \cos \theta_{axis}) = \hat{x}$$



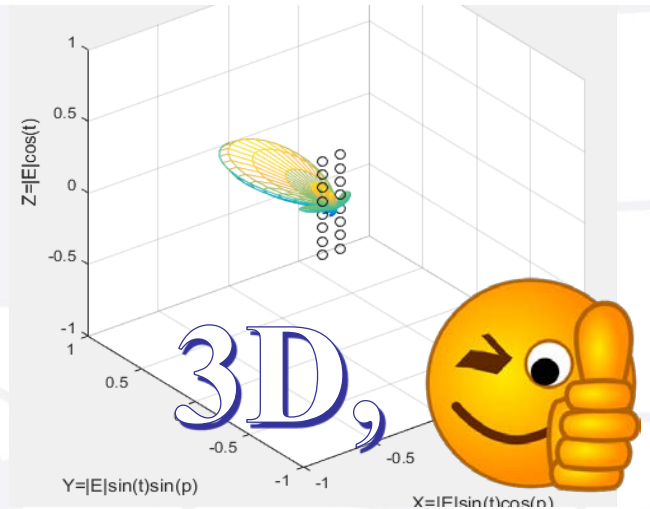
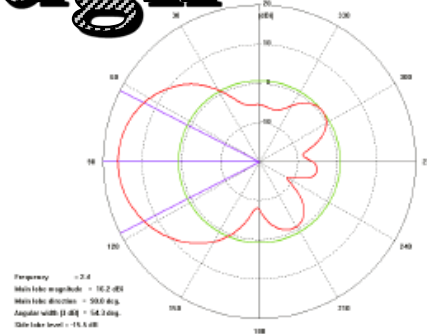
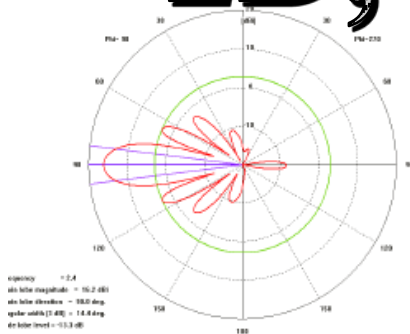
For this example:

$$AF = \left[1 + e^{j(\beta d \cos \theta_a + \alpha)} \right]$$

$$\hat{r} \cdot \hat{x} = \cos \theta_a = u = \sin \theta \cos \phi$$

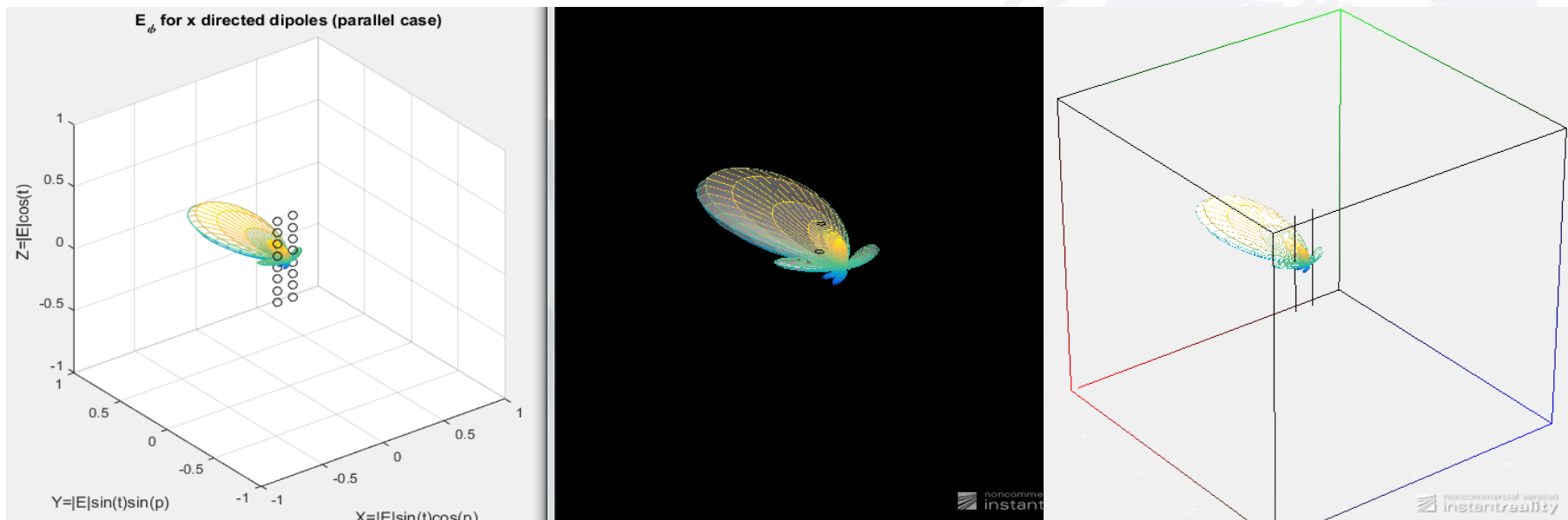
Broadside Scan All Elements Excited

2D, ugh~



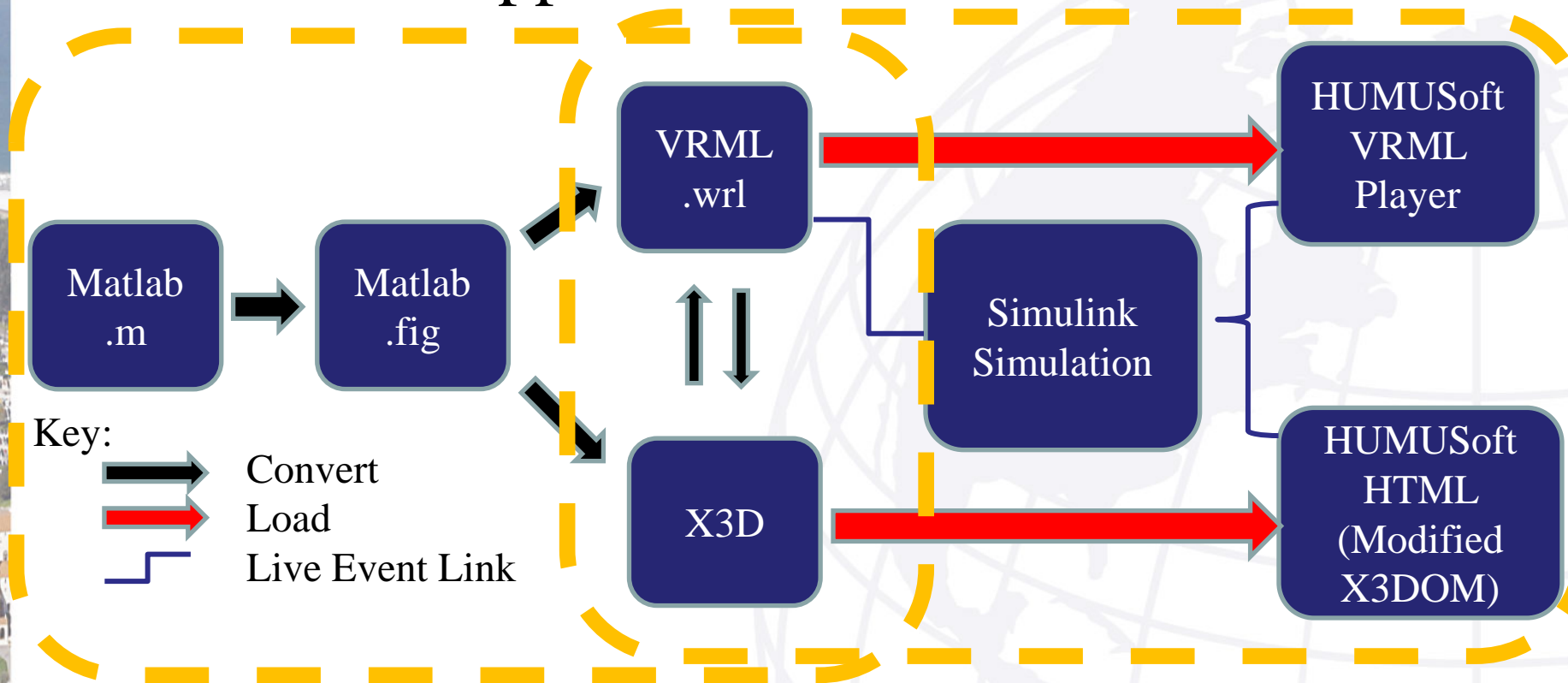
High-Fidelity Engineering Model

Original Phased Array Antenna Model in [Matlab.m](#)
converted to [.x3d](#) and VRML [.wrl](#) and X3DOM [.xhtml](#)

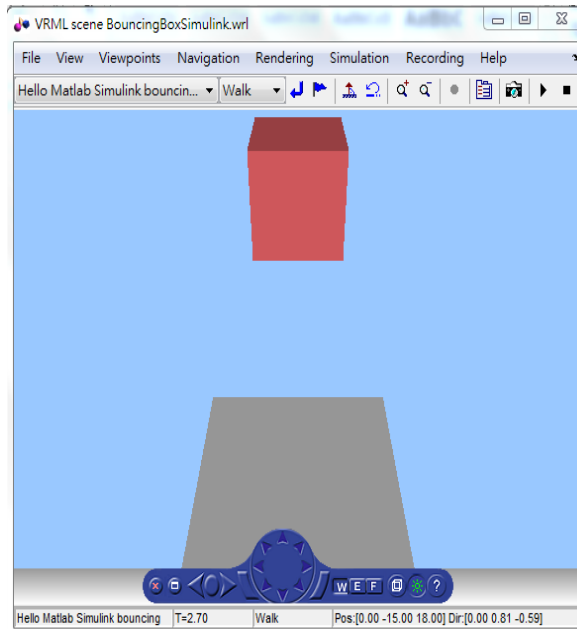


Online at <http://x3dgraphics.com/examples/X3dForAdvancedModeling/Matlab>

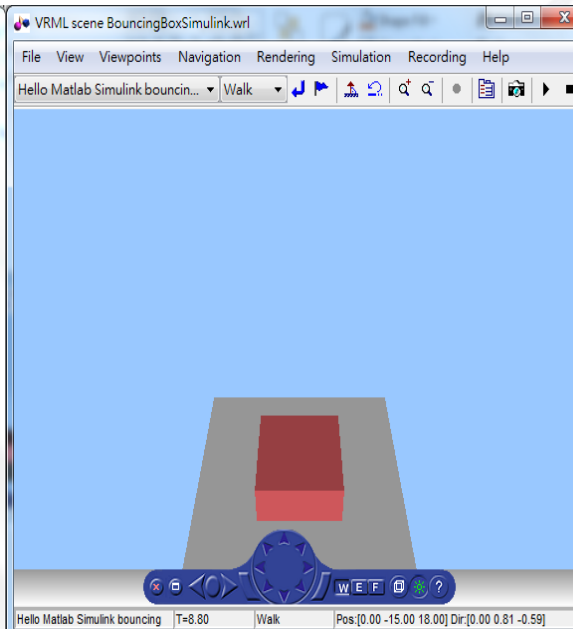
- Matlab and Simulink to Web-Based Simulation Application Flow Chart



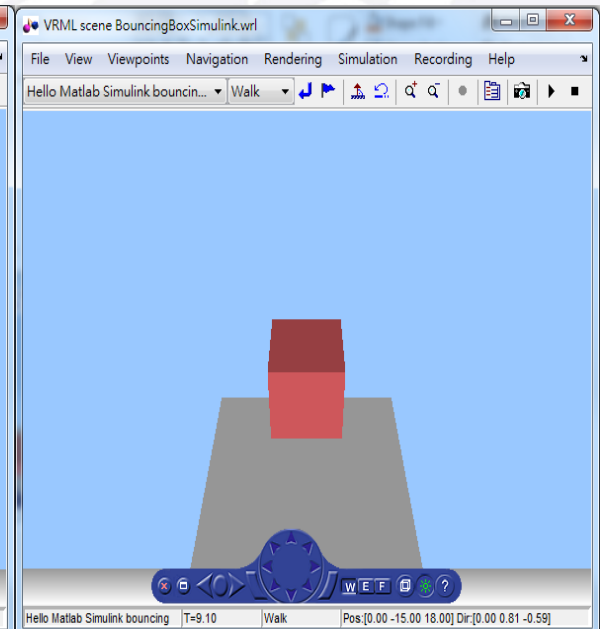
- Simulink block diagrams computing the movement of red cube by Free Fall Equations
- Hooks Law to represent the resilient force



Free Fall

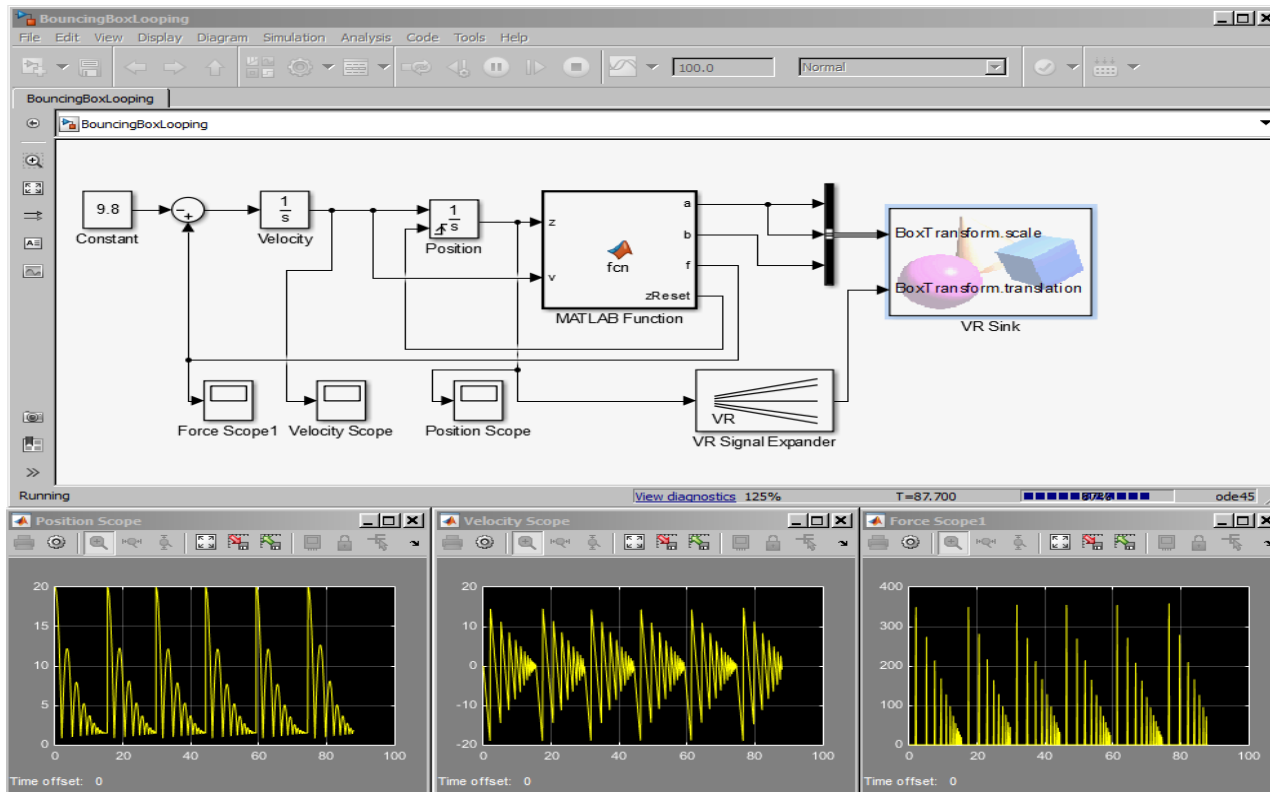


Compressed



Post-Bounce

- Block Diagrams of Simulink Implementation



[X3DOM engine
http://localhost:8123](http://localhost:8123)

[No Attenuation
Example](#)

Position

Velocity

Force Variation

