

MEMS Modeling

How reduced order modeling
fits into system modeling

System
Modeling Level

MEMS Part
Modeling Level

Functional
Modeling Level

Atomic
Modeling Level

System
Modeling Level

MEMS Part
Modeling Level

Functional
Modeling Level

Atomic
Modeling Level

↑
Start

System
Modeling Level

MEMS Part
Modeling Level

Functional
Modeling Level

Atomic
Modeling Level

Before any MEMS design can start, the fundamental mathematics need to be understood.



Start

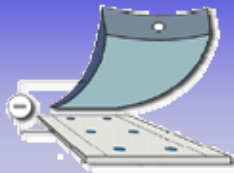


System
Modeling Level

MEMS Part
Modeling Level

Functional
Modeling Level

Beam, Gap
Plate, Contact
Damping



Atomic
Modeling Level

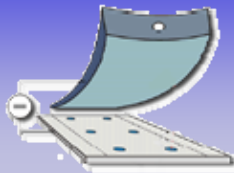
Start

System
Modeling Level

MEMS Part
Modeling Level

Functional
Modeling Level

Beam, Gap
Plate, Contact
Damping



Atomic
Modeling Level

Core Mathematics in
Finite Elements or
ARCHITECT Library

Start

System
Modeling Level

MEMS Part
Modeling Level

Functional
Modeling Level

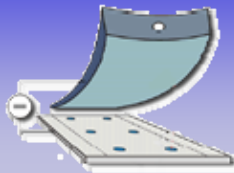
Atomic
Modeling Level

Core Mathematics in
Finite Elements or
ARCHITECT Library

Next, the functional MEMS
design blocks need to be
considered.



Beam, Gap
Plate, Contact
Damping



Start

System
Modeling Level

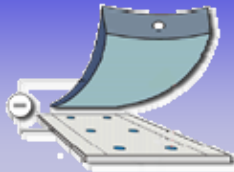
MEMS Part
Modeling Level

Springs (Crab Leg, Serpentine, etc.)
Comb Finger Configurations



Functional
Modeling Level

Beam, Gap
Plate, Contact
Damping



Atomic
Modeling Level

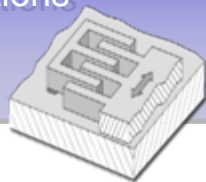
Core Mathematics in
Finite Elements or
ARCHITECT Library

Start

System
Modeling Level

MEMS Part
Modeling Level

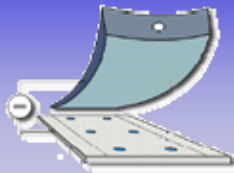
Springs (Crab Leg, Serpentine, etc.)
Comb Finger Configurations



Functional
Modeling Level

Build from Lumped models
or ARCHITECT Library

Beam, Gap
Plate, Contact
Damping



Atomic
Modeling Level

Core Mathematics in
Finite Elements or
ARCHITECT Library

Start

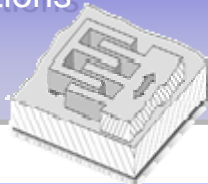
Models of MEMS parts need to be build and designed.



System
Modeling Level

MEMS Part
Modeling Level

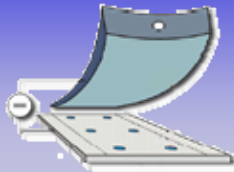
Springs (Crab Leg, Serpentine, etc.)
Comb Finger Configurations



Functional
Modeling Level

Build from Lumped models
or ARCHITECT Library

Beam, Gap
Plate, Contact
Damping



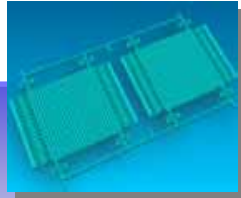
Atomic
Modeling Level

Core Mathematics in
Finite Elements or
ARCHITECT Library

Start

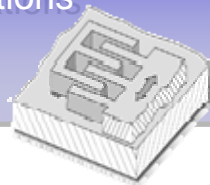
System
Modeling Level

Gyro, Accelerometer
Pressure Sensor
Switch, Resonator, Variable Capacitor



MEMS Part
Modeling Level

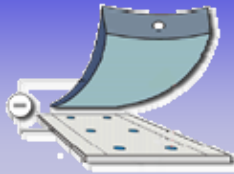
Springs (Crab Leg, Serpentine, etc.)
Comb Finger Configurations



Functional
Modeling Level

Build from Lumped models
or ARCHITECT Library

Beam, Gap
Plate, Contact
Damping



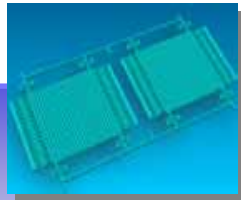
Atomic
Modeling Level

Core Mathematics in
Finite Elements or
ARCHITECT Library

Start

System
Modeling Level

Gyro, Accelerometer
Pressure Sensor
Switch, Resonator, Variable Capacitor



MEMS Part
Modeling Level

Create Part Models

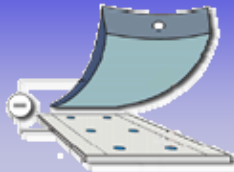
Springs (Crab Leg, Serpentine, etc.)
Comb Finger Configurations



Functional
Modeling Level

Build from Lumped models
or ARCHITECT Library

Beam, Gap
Plate, Contact
Damping



Atomic
Modeling Level

Core Mathematics in
Finite Elements or
ARCHITECT Library

Start

System level design starts with coupling MEMS modeling to ASIC and Package design.

System Modeling Level

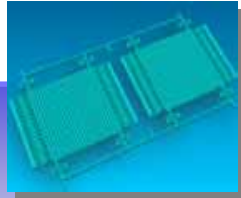
MEMS Part Modeling Level

Functional Modeling Level

Atomic Modeling Level

Start

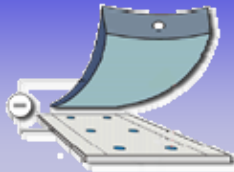
Gyro, Accelerometer
Pressure Sensor
Switch, Resonator, Variable Capacitor



Springs (Crab Leg, Serpentine, etc.)
Comb Finger Configurations



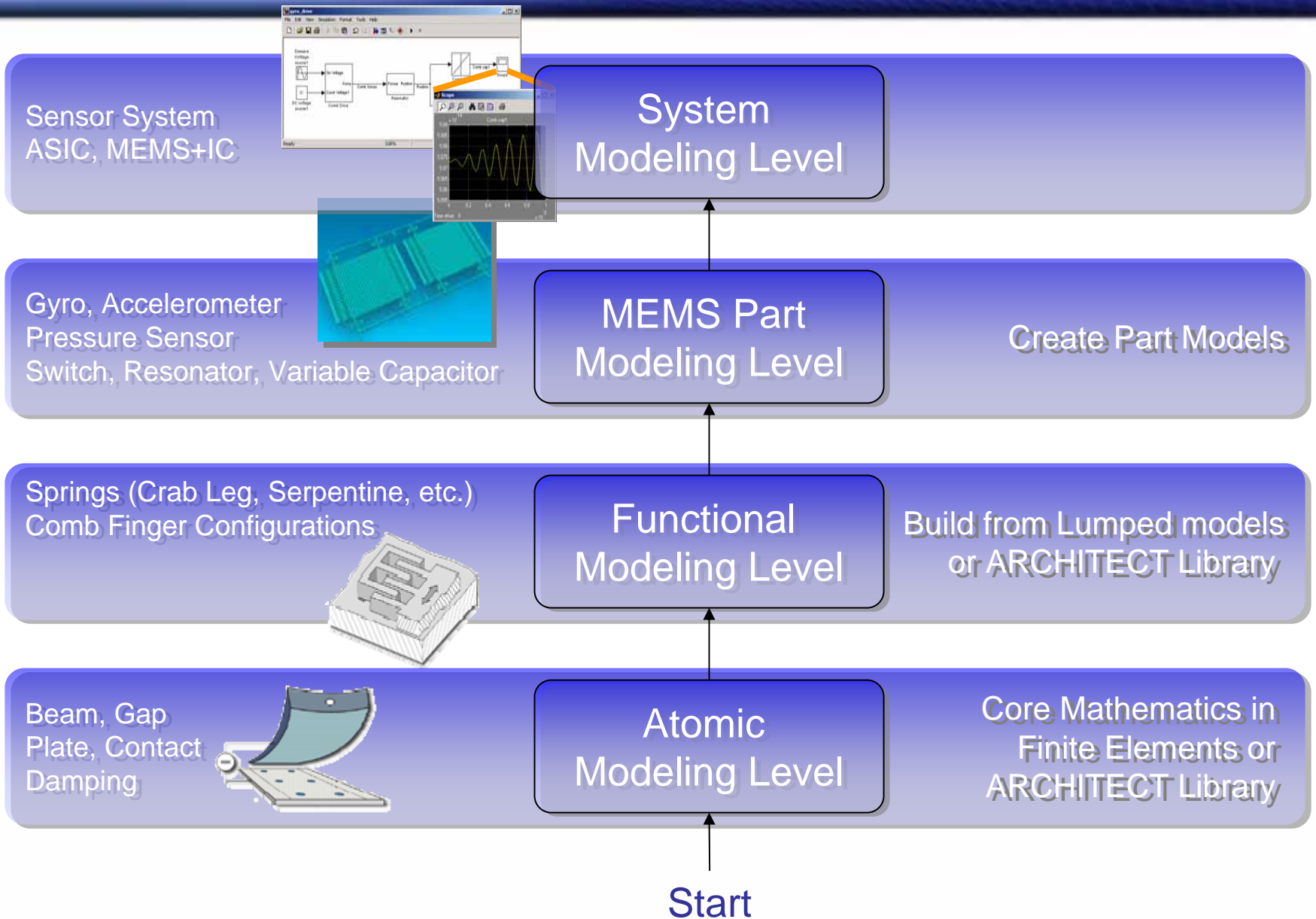
Beam, Gap
Plate, Contact
Damping



Create Part Models

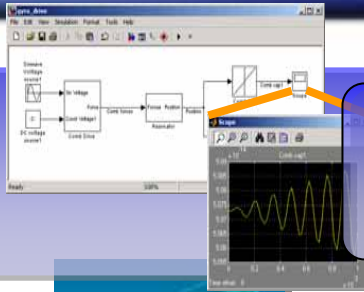
Build from Lumped models
or ARCHITECT Library

Core Mathematics in
Finite Elements or
ARCHITECT Library



Design

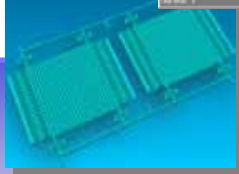
Sensor System
ASIC, MEMS+IC



System
Modeling Level

System Simulation
Tools

Gyro, Accelerometer
Pressure Sensor
Switch, Resonator, Variable Capacitor



MEMS Part
Modeling Level

Create Part Models

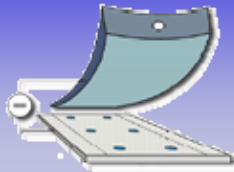
Springs (Crab Leg, Serpentine, etc.)
Comb Finger Configurations



Functional
Modeling Level

Build from Lumped models
or ARCHITECT Library

Beam, Gap
Plate, Contact
Damping



Atomic
Modeling Level

Core Mathematics in
Finite Elements or
ARCHITECT Library

Start