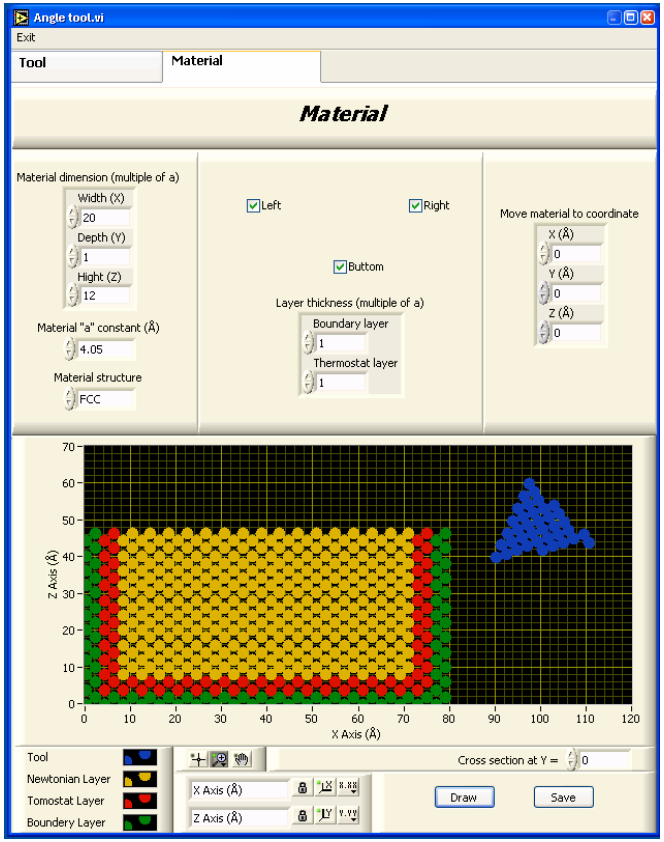
LAMMPS

LAMMPS Pre-processor



- A pre-processor is developed using LabVIEW for generating the atomistic model of workpiece and tool material.
- Cutting parameters (such as depth of cut, tool rake angle, tool clearance angle, and tool edge radius) can be easily changed through the graphical user interface.
- The visualization of initial atom coordinates of tool and workpiece is provided to visually check the correctness of the initial model.

Computational Models

IUPUI
Indiana University–Purdue University Indianapolis
Purdue School of Engineering & Technology
Mechanical Engineering

Nanometric Cutting Model of Copper

Workpiece material	Copper
Workpiece dimension	$21a_1$ x $20a_1$ x $4a_1$; a_1 = 0.362 nm
Crystal orientation	(001)
Tool material	Diamond
Tool dimension	$10a_2$ x $14a_2$ x $5a_2$; a_2 = 0.357 nm
Tool rake angle	-75º to +45º
Tool clearance angle	5º
Width of cut	1.418 nm
Depth of cut	0.724 – 2.172 nm
Cutting speed	5 and 500 m/s
Cutting Direction	[100]
Bulk temperature	293 K
Time steps	2 fs (2×10^{-15} s)

Computational Models

IUPUI
Indiana University–Purdue University Indianapolis
Purdue School of Engineering & Technology
Mechanical Engineering

Nanometric Cutting Model of Aluminum

Workpiece material	Aluminum (Al)
Workpiece dimension	$30a_3$ x $25a_3$ x $4a_3$; a_3 = 0.405 nm
Crystal orientation	(001)
Tool material	Diamond (C)
Tool dimension	$12a_2$ x $20a_2$ x $5a_2$; a_2 = 0.357 nm
Tool rake angle	0º ,10º, and 40º
Tool clearance angle	5º
Width of cut	1.62 nm
Depth of cut	0.81– 1.62 nm
Cutting speed	500 m/s
Cutting Direction	[100]
Bulk temperature	293 K
Time steps	2 fs (2 x 10^{-15} s)