Table 4: Industrial HPCC Applications 1 to 5: SIMULATION

<table>
<tr><th>Item</th><th>Application Area
and Examples</th><th>Problem
Comments</th><th>Machine
and Software</th></tr>
<tr><td>1</td><td>Computational Fluid Dynamics
• Aerospace
• Military, Civilian Vehicles
• Propulsion</td><td>• PDE, FEM
• Turbulence
• Mesh Generation</td><td>• SIMD, MIMD for irregular adaptive
• HPF(+) but
• Unclear for adaptive irregular mesh</td></tr>
<tr><td>2</td><td>Structural Dynamics</td><td>• PDE, FEM
• Dominated by Vendor Codes such as NASTRAN</td><td>• MIMD as complex geometry
• HPF(+)</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">Electromagnetic Simulation
• Antenna Design
• Stealth Vehicles
• Noise in high frequency circuits
• Mobile Phones</td><td>• PDE solved by moment method
• Matrix solve dominates</td><td>SIMD
HPF</td></tr>
<tr><td>• Newer FEM and FD Methods?
• Also fast multipole</td><td>SIMD, MIMD
HPF(+)</td></tr>
<tr><td rowspan="3">4</td><td rowspan="3">Scheduling
• Manufacturing
• Transportation (Dairy delivery to Military deployment)
• University Classes
• Airline Scheduling of crews, planes in static or dynamic (Syracuse snow storm) cases</td><td>Expert Systems
and/or</td><td>MIMD
(unclear Speedup)
AsyncSoft</td></tr>
<tr><td>Neural Networks
Simulated annealing</td><td>SIMD
HPF</td></tr>
<tr><td>Linear Programming
(hard sparse matrix)</td><td>MIMD
HPF+?</td></tr>
<tr><td>5</td><td>Environmental Modeling—
Earth/Ocean/Atmospheric Simulation</td><td>• PDE, FD, FEM
• Sensitivity to Data</td><td>• SIMD but
• MIMD for irregular adaptive mesh
• HPF(+) except this unclear for adaptive irregular mesh</td></tr>
</table>