10. Introduction to Data-Parallel Architectures

- SIMD (Single Instruction Multiple Data)
- 10.1 Introduction
- 10.2 Connectivity
- 10.3 Alternative architecture

- e.g. add: (c1=a1+b1), (c2=a2+b2), (c3=a3+b3)

Data-parallel computation (bit parallel)

Application of Data-parallel Architectures:
One data entity processed by one PE

Mapping Problem space into Architectural Space:
Data entity onto PE (1-to-1 mapping)

Near-neighbor connectivity (2-D: Mesh)

Tree: 2-D hierarchy
Pyramid: 3-D hierarchy

Hypercube: 2^N nodes in N dimension

Hypercube: 4-D
Long and short-range connections

Data-parallel approaches

Principal characteristics of data-parallel systems

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<th>Property</th>
<th>SIMD</th>
<th>Systolic</th>
<th>Pipeline</th>
<th>Vectorizing</th>
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<td>Programmability</td>
<td>Good</td>
<td>Poor</td>
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<td>Availability</td>
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<td>Scalability</td>
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<tr>
<td>Applicability</td>
<td>Wide</td>
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