**Homework 8**

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1. Principle of Locality
   1. A program with low locality (of either type) would involve no loops and accessing data from many different and random memory locations.  
        
      load location 1000  
      load location 2000  
      load location 1500  
      etc.
   2. A program with high temporal locality would involve loading the same value many times.  
        
      a: load 1000  
      add 1  
      store 1000  
      jump a
   3. High spatial locality would involve accessing sequential units of data.  
        
      a = 1  
      x: load a  
      a+1  
      jump x
   4. This would involve many different instructions of different types without repeating them.  
        
      add …  
      subtract …  
      load …  
      branch …
   5. High temporal locality would involve repeating and instruction a lot.  
        
      add …  
      add …  
      add …
   6. High spatial locality would involve using a lot of instructions of the same type.  
        
      add …  
      addi …  
      sub …  
      subi …
2. Cache Configuration and Performance
   1. 2 – 000 0010 miss  
      3 – 000 0011 miss  
      11 – 000 1011 miss  
      16 – 001 0000 miss  
      22 – 001 0110 miss  
      13 – 000 1101 miss  
      64 – 100 0000 miss  
      48 – 011 0000 hit  
      19 – hit  
      11 – hit  
      3 – hit  
      22 – hit  
      4 – miss  
      27 – hit  
      6 – hit  
      11 – hit

|  |  |  |  |
| --- | --- | --- | --- |
| Index | Valid | Tag | Data |
| 0000 | 1 | 011 | 48 |
| 0001 | 0 |  |  |
| 0010 | 1 | 000 | 2 |
| 0011 | 1 | 000 | 3 |
| 0100 | 1 | 000 | 4 |
| 0101 | 0 |  |  |
| 0110 | 1 | 000 | 6 |
| 0111 | 0 |  |  |
| 1000 | 0 |  |  |
| 1001 | 0 |  |  |
| 1010 | 0 |  |  |
| 1011 | 1 | 000 | 11 |
| 1100 | 0 |  |  |
| 1101 | 1 | 000 | 13 |
| 1110 | 0 |  |  |
| 1111 | 0 |  |  |