MIPS Data Transfer Instructions

Opcode rt, immed (rs)

- rt: the loaded or stored value
- immed (rs): the memory address
  - rs: base address
  - immed: signed 16-bit offset value (displacement)
- full address = base + offset
  - allows a full 32 bit address
  - can address ± 32KB from base address

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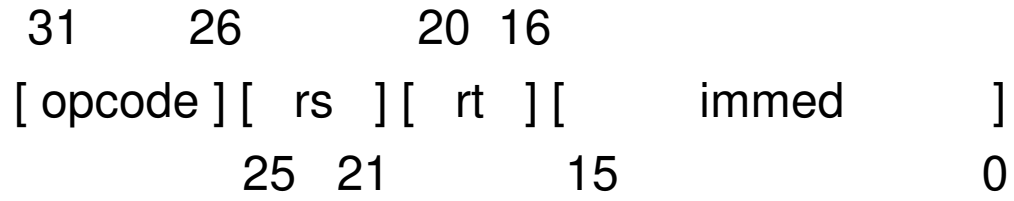
Some examples:

```
lw  $8, 46($10)     # $8 = memory[$10+46]
sw  $8, 46($10)     # memory[$10+46] = $8
lb  $9, -256($10)   # $9=sign-extended(memory[$10-256])
lbu $9, -256($10)   # $9 =zero-extended(memory[$10-256])
sh  $9, -256($10)   # memory[$10-256] = the least
                    # significant halfword of $9
```

I-type Format

I-type format used for data transfer instructions



- **opcode** = operation
    - opcode = data transfer instruction
- **rs** = base address
- **rt** = register value that is loaded from or stored to memory
- **immed** = address offset in bytes, $\pm 2^{15}$
    - sign-extended when used (replicate msb)

```
lw $14, 8($sp)
[  35 ][  29  ][  14  ][      8         ]
```