

Motivating Example

```
void quantum_cond_phase(
int control, int target, quantum_reg *reg){
    int i;
    COMPLEX_FLOAT z;
    if(quantum_objcode_put(COND_PHASE, control, target))
        return;
    z = quantum_cexp(pi / (1 << (control - target)));
    for(i=0; i<reg->size; i++) {
        if(reg->node[i].state & (1 << control)) {
            if(reg->node[i].state & (1 << target))
                reg->node[i].amplitude *= z;
        }
    }
    quantum_decohere(reg);
}
```

```
void quantum_cond_phase_inv(
int control, int target, quantum_reg *reg){
    int i;
    COMPLEX_FLOAT z;

    z = quantum_cexp(-pi / (1 << (control - target)));
    for(i=0; i<reg->size; i++) {
        if(reg->node[i].state & (1 << control)) {
            if(reg->node[i].state & (1 << target))
                reg->node[i].amplitude *= z;
        }
    }
    quantum_decohere(reg);
}
```



```
void merged(bool func_id,
int control, int target, quantum_reg *reg){
    int i;
    COMPLEX_FLOAT z;
    if(func_id)
        if(quantum_objcode_put(COND_PHASE, control, target))
            return;
    float var = (func_id)?pi:(-pi);
    z = quantum_cexp(var / (1 << (control - target)));
    for(i=0; i<reg->size; i++) {
        if(reg->node[i].state & (1 << control)) {
            if(reg->node[i].state & (1 << target))
                reg->node[i].amplitude *= z;
        }
    }
    quantum_decohere(reg);
}
```