BOOTHS MULTIPLICATION

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| #include <stdio.h> |
|  | #include <math.h> |
|  | int a = 0,b = 0, c = 0, a1 = 0, b1 = 0, com[5] = { 1, 0, 0, 0, 0}; |
|  | int anum[5] = {0}, anumcp[5] = {0}, bnum[5] = {0}; |
|  | int acomp[5] = {0}, bcomp[5] = {0}, pro[5] = {0}, res[5] = {0}; |
|  | void binary(){ |
|  | a1 = fabs(a); |
|  | b1 = fabs(b); |
|  | int r, r2, i, temp; |
|  | for (i = 0; i < 5; i++){ |
|  | r = a1 % 2; |
|  | a1 = a1 / 2; |
|  | r2 = b1 % 2; |
|  | b1 = b1 / 2; |
|  | anum[i] = r; |
|  | anumcp[i] = r; |
|  | bnum[i] = r2; |
|  | if(r2 == 0){ |
|  | bcomp[i] = 1; |
|  | } |
|  | if(r == 0){ |
|  | acomp[i] =1; |
|  | } |
|  | } |
|  | //part for two's complementing |
|  | c = 0; |
|  | for ( i = 0; i < 5; i++){ |
|  | res[i] = com[i]+ bcomp[i] + c; |
|  | if(res[i] >= 2){ |
|  | c = 1; |
|  | } |
|  | else |
|  | c = 0; |
|  | res[i] = res[i] % 2; |
|  | } |
|  | for (i = 4; i >= 0; i--){ |
|  | bcomp[i] = res[i]; |
|  | } |
|  | //in case of negative inputs |
|  | if (a < 0){ |
|  | c = 0; |
|  | for (i = 4; i >= 0; i--){ |
|  | res[i] = 0; |
|  | } |
|  | for ( i = 0; i < 5; i++){ |
|  | res[i] = com[i] + acomp[i] + c; |
|  | if (res[i] >= 2){ |
|  | c = 1; |
|  | } |
|  | else |
|  | c = 0; |
|  | res[i] = res[i]%2; |
|  | } |
|  | for (i = 4; i >= 0; i--){ |
|  | anum[i] = res[i]; |
|  | anumcp[i] = res[i]; |
|  | } |
|  | } |
|  | if(b < 0){ |
|  | for (i = 0; i < 5; i++){ |
|  | temp = bnum[i]; |
|  | bnum[i] = bcomp[i]; |
|  | bcomp[i] = temp; |
|  | } |
|  | } |
|  | } |
|  | void add(int num[]){ |
|  | int i; |
|  | c = 0; |
|  | for ( i = 0; i < 5; i++){ |
|  | res[i] = pro[i] + num[i] + c; |
|  | if (res[i] >= 2){ |
|  | c = 1; |
|  | } |
|  | else{ |
|  | c = 0; |
|  | } |
|  | res[i] = res[i]%2; |
|  | } |
|  | for (i = 4; i >= 0; i--){ |
|  | pro[i] = res[i]; |
|  | printf("%d",pro[i]); |
|  | } |
|  | printf(":"); |
|  | for (i = 4; i >= 0; i--){ |
|  | printf("%d", anumcp[i]); |
|  | } |
|  | } |
|  | void arshift(){//for arithmetic shift right |
|  | int temp = pro[4], temp2 = pro[0], i; |
|  | for (i = 1; i < 5 ; i++){//shift the MSB of product |
|  | pro[i-1] = pro[i]; |
|  | } |
|  | pro[4] = temp; |
|  | for (i = 1; i < 5 ; i++){//shift the LSB of product |
|  | anumcp[i-1] = anumcp[i]; |
|  | } |
|  | anumcp[4] = temp2; |
|  | printf("\nAR-SHIFT: ");//display together |
|  | for (i = 4; i >= 0; i--){ |
|  | printf("%d",pro[i]); |
|  | } |
|  | printf(":"); |
|  | for(i = 4; i >= 0; i--){ |
|  | printf("%d", anumcp[i]); |
|  | } |
|  | } |
|  | int main(){ |
|  | int i, q = 0; |
|  | printf("\t\tBOOTH'S MULTIPLICATION ALGORITHM"); |
|  | printf("\nEnter two numbers to multiply: "); |
|  | printf("\nBoth must be less than 16"); |
|  | //simulating for two numbers each below 16 |
|  | do{ |
|  | printf("\nEnter A: "); |
|  | scanf("%d",&a); |
|  | printf("Enter B: "); |
|  | scanf("%d", &b); |
|  | }while(a >=16 || b >=16); |
|  | printf("\nExpected product = %d", a \* b); |
|  | binary(); |
|  | printf("\n\nBinary Equivalents are: "); |
|  | printf("\nA = "); |
|  | for (i = 4; i >= 0; i--){ |
|  | printf("%d", anum[i]); |
|  | } |
|  | printf("\nB = "); |
|  | for (i = 4; i >= 0; i--){ |
|  | printf("%d", bnum[i]); |
|  | } |
|  | printf("\nB'+ 1 = "); |
|  | for (i = 4; i >= 0; i--){ |
|  | printf("%d", bcomp[i]); |
|  | } |
|  | printf("\n\n"); |
|  | for (i = 0;i < 5; i++){ |
|  | if (anum[i] == q){//just shift for 00 or 11 |
|  | printf("\n-->"); |
|  | arshift(); |
|  | q = anum[i]; |
|  | } |
|  | else if(anum[i] == 1 && q == 0){//subtract and shift for 10 |
|  | printf("\n-->"); |
|  | printf("\nSUB B: "); |
|  | add(bcomp);//add two's complement to implement subtraction |
|  | arshift(); |
|  | q = anum[i]; |
|  | } |
|  | else{//add ans shift for 01 |
|  | printf("\n-->"); |
|  | printf("\nADD B: "); |
|  | add(bnum); |
|  | arshift(); |
|  | q = anum[i]; |
|  | } |
|  | } |
|  | printf("\nProduct is = "); |
|  | for (i = 4; i >= 0; i--){ |
|  | printf("%d", pro[i]); |
|  | } |
|  | for (i = 4; i >= 0; i--){ |
|  | printf("%d", anumcp[i]); |
|  | } |
|  | } |

