1* Intro. This program generates clauses that enforce the constraint $x_1 + \cdots + x_n \leq r$, using a method due to Carsten Sinz [Lecture Notes in Computer Science 3709 (2005), 827–831]. It introduces $r(n - r)$ new variables $S_i^j$ for $1 \leq i \leq n - r$ and $1 \leq j \leq r$, and generates a total of $(r + 1)(n - r) + r(n - r - 1)$ clauses involving these variables and $x_1$ through $x_n$. All clauses have length 3 or less.

This version inputs a graph (specified as a third parameter) and a color number (specified fourth). The output clauses will limit the number of vertices of that color.

```c
#include <stdio.h>
#include <stdlib.h>
#include "gb_graph.h"
#include "gb_save.h"

int n, r, kk;

main(int argc, char *argv[]) {
    register int i, j, k;
    Graph *g;
    (Process the command line 2*);
    for (j = 1; j <= r; j++) (Generate the horizontal clauses for row j 3);
    for (j = 0; j <= r; j++) (Generate the vertical clauses for row j 4*);
}
2* (Process the command line 2*)
if (argc != 5) {fscanf(stderr, "Usage: %s n r foo.gb %d
", argv[0]);
    exit(-1);
}

if (argc != 2) {
    fprintf(stderr, "I can't input the graph %s!
", argv[3]);
    exit(-2);
}

if (g->n != n) {fprintf(stderr, "The graph has %ld vertices, not %d!
", g->n, n);
   exit(-2);
}

printf("sat-threshold-sinz-%d-%d
", n, r);

This code is used in section 1*.

3. (Generate the horizontal clauses for row j 3) for (i = 1; i < n - r; i++) printf("S%d.%d S%d.%d \n", i, j, i + 1, j);
This code is used in section 1*.

4* #define xbar(k) printf("S%d.%d", (g->vertices + k - 1)-name, kk)
(Generate the vertical clauses for row j 4*) for (i = 1; i <= n - r; i++) {
    xbar(i + j);
    if (j) printf("S%d.%d", i, j);
    if (j < r) printf("S%d.%d", i, j + 1);
    printf("\n");
}
This code is used in section 1*.
5* Index.
The following sections were changed by the change file: 1, 2, 4, 5.

argc: 1* 2*
argv: 1* 2*
exit: 2*
fprintf: 2*
Graph: 1*
i: 1*
j: 1*
k: 1*
kk: 1* 2* 4*
main: 1*
n: 1*
name: 4*
printf: 2* 3, 4*
r: 1*
restore_graph: 2*
sscanf: 2*
stderr: 2*
vertices: 4*
xbar: 4*
\{\text{Generate the horizontal clauses for row } j \ 3\} \text{ Used in section 1*}.
\{\text{Generate the vertical clauses for row } j \ 4^*\} \text{ Used in section 1*}.
\{\text{Process the command line } 2^*\} \text{ Used in section 1*}.
## SAT-THRESHOLD-SINZ-GRAPHS

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