Advanced Unix Programming

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Assignment-9

Q1. Catch the SIGTERM signal, ignore SIGINT and accept the default action for SIGSEGV. Later let the program be suspended until it is interrupted by a signal. Implement using signal and sigaction.

CODE:

```
#include<stdio.h>
#include<signal.h>
#include<signal.h>
#include<stdlib.h>
#include<string.h>
static void sig_usr(int signo){
	if(signo == SIGTERM)
		printf("SIGTERM signal catched\n");
}
void quitproc(){
		 printf("ctrl-\\ pressed to quit\n");
		 exit(0); /* normal exit status */
}

int main(){
	if(signal(SIGINT,SIG_IGN) == SIG_ERR)
		printf("can't Ignore SIGINT");
	if(signal(SIGTERM,sig_usr) == SIG_ERR)
		printf("can't catch SIGTERM");
	if(signal(SIGSEGV,SIG_DFL) == SIG_ERR)
		printf("can't catch SIGSEGV");
	if(signal(SIGQUIT,quitproc) == SIG_ERR)
		printf("can't catch SIGQUIT");
	for(; ;)
		pause();
}
```

Output:

```
nik@nik-Lenovo-G50-70: ~/aup/AUP/Lab9
nik@nik-Lenovo-G50-70:~/aup/AUP/Lab9$ ./a.out &
[1] 4832
nik@nik-Lenovo-G50-70:~/aup/AUP/Lab9$ ps
  PID TTY          TIME CMD
 3945 pts/11   00:00:00 bash
 4832 pts/11   00:00:00 a.out
 4834 pts/11   00:00:00 ps
nik@nik-Lenovo-G50-70:~/aup/AUP/Lab9$ kill -l
 1) SIGHUP       2) SIGINT       3) SIGQUIT      4) SIGILL       5) SIGTRAP
 6) SIGABRT      7) SIGBUS       8) SIGFPE       9) SIGKILL     10) SIGUSR1
11) SIGSEGV     12) SIGUSR2     13) SIGPIPE     14) SIGALRM     15) SIGTERM
16) SIGSTKFLT   17) SIGCHLD     18) SIGCONT     19) SIGSTOP     20) SIGTSTP
21) SIGTTIN     22) SIGTTOU     23) SIGURG      24) SIGXCPU     25) SIGXFSZ
26) SIGVTALRM   27) SIGPROF     28) SIGWINCH    29) SIGIO       30) SIGPWR
31) SIGSYS      34) SIGRTMIN    35) SIGRTMIN+1  36) SIGRTMIN+2  37) SIGRTMIN+3
38) SIGRTMIN+4  39) SIGRTMIN+5  40) SIGRTMIN+6  41) SIGRTMIN+7  42) SIGRTMIN+8
43) SIGRTMIN+9  44) SIGRTMIN+10 45) SIGRTMIN+11 46) SIGRTMIN+12 47) SIGRTMIN+13
48) SIGRTMIN+14 49) SIGRTMIN+15 50) SIGRTMAX-14 51) SIGRTMAX-13 52) SIGRTMAX-12
53) SIGRTMAX-11 54) SIGRTMAX-10 55) SIGRTMAX-9  56) SIGRTMAX-8  57) SIGRTMAX-7
58) SIGRTMAX-6  59) SIGRTMAX-5  60) SIGRTMAX-4  61) SIGRTMAX-3  62) SIGRTMAX-2
63) SIGRTMAX-1  64) SIGRTMAX
nik@nik-Lenovo-G50-70:~/aup/AUP/Lab9$ #sending sigint
nik@nik-Lenovo-G50-70:~/aup/AUP/Lab9$ kill -2 4832
nik@nik-Lenovo-G50-70:~/aup/AUP/Lab9$ ps
  PID TTY          TIME CMD
 3945 pts/11   00:00:00 bash
 4832 pts/11   00:00:00 a.out
 4838 pts/11   00:00:00 ps
nik@nik-Lenovo-G50-70:~/aup/AUP/Lab9$ kill -15 4832
SIGTERM signal catched
nik@nik-Lenovo-G50-70:~/aup/AUP/Lab9$ kill -11 4832
nik@nik-Lenovo-G50-70:~/aup/AUP/Lab9$ ps
  PID TTY          TIME CMD
 3945 pts/11   00:00:00 bash
 4868 pts/11   00:00:00 ps
[1]+  Segmentation fault      (core dumped) ./a.out
nik@nik-Lenovo-G50-70:~/aup/AUP/Lab9$ ps
  PID TTY          TIME CMD
 3945 pts/11   00:00:00 bash
 4897 pts/11   00:00:00 ps
nik@nik-Lenovo-G50-70:~/aup/AUP/Lab9$ ./a.out &
[1] 4898
nik@nik-Lenovo-G50-70:~/aup/AUP/Lab9$
```

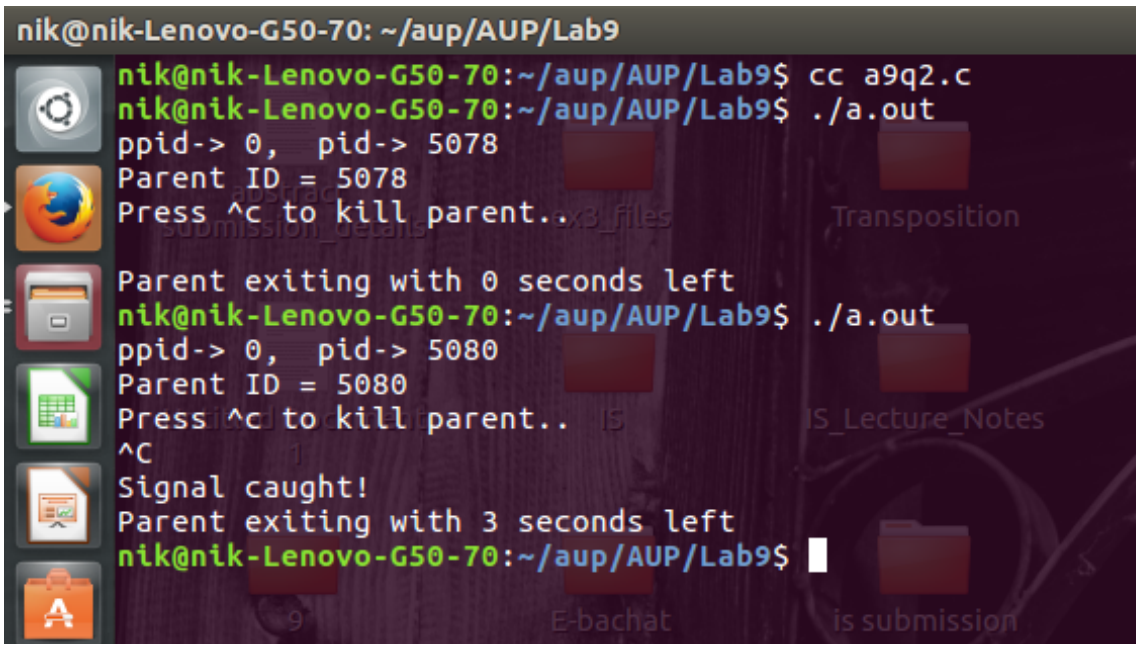
```
nik@nik-Lenovo-G50-70: ~/aup/AUP/Lab9
nik@nik-Lenovo-G50-70:~/aup/AUP/Lab9$ ps
  PID TTY          TIME CMD
 3945 pts/11   00:00:00 bash
 4898 pts/11   00:00:00 a.out
 4919 pts/11   00:00:00 ps
nik@nik-Lenovo-G50-70:~/aup/AUP/Lab9$ fg % 1
./a.out
^\ctrl-\ pressed to quit
nik@nik-Lenovo-G50-70:~/aup/AUP/Lab9$
```

Q2. Create a child process. Let the parent sleeps of 5 seconds and exits. Can the child send SIGINT to its parent if exists and kill it? Verify with a sample program.

CODE:

```
#include<stdio.h>
#include<signal.h>
#include<unistd.h>
#include<stdlib.h>
void sig_usr(int signo){
	if(signo == SIGINT)
	printf("\nSignal caught!");
	return;
}
int main(void){
	pid_t pid, ppid;
	if((pid = fork()) == 0){
		ppid = getpid();
		printf("ppid = %d\n", ppid);
		printf("Press ^c to kill parent..\n");
		kill(ppid, SIGINT);
		printf("After killing parent...\n");
	}
	else{
		printf("ppid-> %d pid-> %d ",ppid, pid);
		if(signal(SIGINT,sig_usr) == SIG_ERR)
			printf("Signal processed ");
		int time = sleep(5);
		printf("\nParent exiting with %d seconds left\n", time);
	}
	return 0;
}
```

OUTPUT:



Q3. mplement sleep using signal function which takes care of the following:

a. If the caller has already an alarm set, that alarm is not erased by the call to alarm inside sleep implementation.

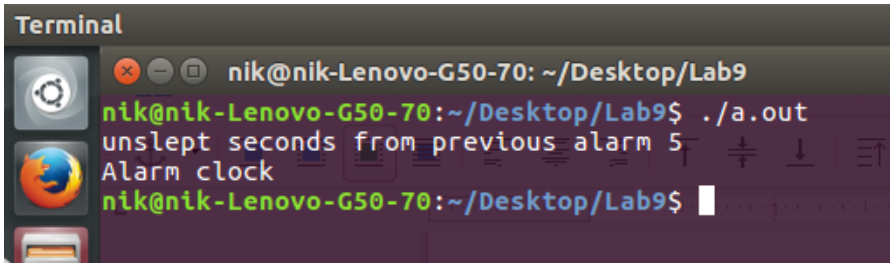
b. If sleep modifies the current disposition of SIGALRM, restore it

c. Avoid race condition between first call to alarm and pause inside sleep implementation using setjmp.

CODE:

```
#include<setjmp.h>
#include<stdio.h>
#include<stdlib.h>
#include<unistd.h>
#include<signal.h>

static jmp_buf jb;

int sig_alrm(int signo){
	longjmp(jb, 1);
}

unsigned int sleep2(unsigned int secs){
	int time_left;
	time_left = alarm(0);		/* unslept seconds left from previous alarm */
	printf("unslept seconds from previous alarm %d\n", time_left);
	if(setjmp(jb) == 0){
		alarm(secs - time_left);	/* adding that time for user set value */
		pause();
	}
}

int main(){
	alarm(5);
	sleep2(7);
}
```

OUTPUT:



Q4. "Child inherit parent's signal mask when it is created, but pending signals for the parent process are not passed on". Write appropriate program and test with suitable inputs to verify this.

CODE:

```
#include <stdio.h>
#include <stdlib.h>
#include <signal.h>
void err_sys(const char* x){
	perror(x);
	exit(1);
}
static void sig_quit(int signo){
	printf("caught SIGQUIT\n");
	if (signal(SIGQUIT, SIG_DFL) == SIG_ERR)
		err_sys("can't reset SIGQUIT");
}
void check_sigset(sigset_t sigset){
	int i;
	for(i = 0; i < 31; i++){
		if(sigismember(&sigset, i)){
			printf("SIGNAL %d present\n", i);
		}
	}
}
int main(void){
	sigset_t newmask, oldmask, pendmask, sigset;
	pid_t pid;

	if (signal(SIGQUIT, sig_quit) == SIG_ERR)
		err_sys("can't catch SIGQUIT");
	sigemptyset(&newmask);
	sigaddset(&newmask, SIGQUIT); // adding SIGQUIT to newmask

	if (sigprocmask(SIG_BLOCK, &newmask, &oldmask) < 0) // added SIGQUIT to BLOCK
		err_sys("SIG_BLOCK error");

	printf("Send SIGQUIT signals\n");
```

```
	sleep(5);
	/* SIGQUIT here will remain pending */
	if((pid = fork()) == -1){
		err_sys("Fork Error");
	}
	if(pid){
		printf("IN PARENT:\n");
		if (sigprocmask(0, NULL, &sigset) < 0) {
			err_sys("Error getting signal mask");
		}
		else {
			check_sigset(sigset);
		}

		if (sigpending(&pendmask) < 0)
			err_sys("signal pending error");

		if (sigismember(&pendmask, SIGQUIT))
			printf("IN PARENT: SIGQUIT pending\n");

		wait();
	}
	else {
		sigset_t childsigset;
		printf("IN CHILD:\n");
		if (sigprocmask(0, NULL, &childsigset) < 0) {
			err_sys("Error getting signal mask");
		}
		else {
			check_sigset(childsigset);
		}

		if (sigpending(&pendmask) < 0){
			err_sys("sigpending error");
		}

		if (sigismember(&pendmask, SIGQUIT)){
			printf("IN CHILD: SIGQUIT pending\n");
		}
		else {
			printf("IN CHILD: SIGQUIT not pending in CHILD\n");
		}
	}
}
```

OUTPUT:

```
Terminal
nik@nik-Lenovo-G50-70: ~/Desktop/Lab9
nik@nik-Lenovo-G50-70:~/Desktop/Lab9$ ./a.out &
[1] 4124
nik@nik-Lenovo-G50-70:~/Desktop/Lab9$ Send SIGQUIT signals

nik@nik-Lenovo-G50-70:~/Desktop/Lab9$ kill -3 4124
nik@nik-Lenovo-G50-70:~/Desktop/Lab9$ IN PARENT:
SIGNAL 0 present
SIGNAL 3 present
IN CHILD:
IN PARENT: SIGQUIT pending
SIGNAL 0 present
SIGNAL 3 present
IN CHILD: SIGQUIT not pending in CHILD

[1]+  Done                    ./a.out
nik@nik-Lenovo-G50-70:~/Desktop/Lab9$
```

```
Terminal
nik@nik-Lenovo-G50-70: ~/Desktop/Lab9
nik@nik-Lenovo-G50-70:~/Desktop/Lab9$ ./a.out &
[1] 4171
nik@nik-Lenovo-G50-70:~/Desktop/Lab9$ Send SIGQUIT signals

nik@nik-Lenovo-G50-70:~/Desktop/Lab9$ IN PARENT:
SIGNAL 0 present
IN CHILD:
SIGNAL 3 present
SIGNAL 0 present
SIGNAL 3 present
IN CHILD: SIGQUIT not pending in CHILD

[1]+  Done                    ./a.out
nik@nik-Lenovo-G50-70:~/Desktop/Lab9$
```

```
Terminal
nik@nik-Lenovo-G50-70: ~/Desktop/Lab9
nik@nik-Lenovo-G50-70:~/Desktop/Lab9$ ./a.out
Send SIGQUIT signals
^\^\IN PARENT:
SIGNAL 0 present
SIGNAL 3 present
IN CHILD:
IN PARENT: SIGQUIT pending
SIGNAL 0 present
SIGNAL 3 present
IN CHILD: SIGQUIT not pending in CHILD
nik@nik-Lenovo-G50-70:~/Desktop/Lab9$ ./a.out
Send SIGQUIT signals
IN PARENT:
SIGNAL 0 present
SIGNAL 3 present
IN CHILD:
SIGNAL 0 present
SIGNAL 3 present
IN CHILD: SIGQUIT not pending in CHILD
nik@nik-Lenovo-G50-70:~/Desktop/Lab9$
```