

### PSET 4: Problem 3 – Fixing your cat

#### Source Code:

```
#include <stdio.h>
#include <string.h>
#include <errno.h>
#include <sys/wait.h>
#include <stdlib.h>
#include <fcntl.h>
#include <sys/types.h>
#include <sys/signal.h>
#include <unistd.h>

long buffersize = 4096;
char *pattern = NULL;
int processedfiles = 0;
int processedbytes = 0;
int inputfile;

void sighandler(int sig){
    fprintf(stderr,"\n\nProcess interrupted by SIGINT\n");
    fprintf(stderr,"Files processed: %d Bytes processed: %d \n",processedfiles,processedbytes);
    exit(EXIT_FAILURE);
}

void sigpipehandler(int sig){
    fprintf(stderr,"Broken Pipe\n");
    exit(EXIT_FAILURE);
}

int main(int argc, char **argv){

    int m = -1;
    int n = -1;

    if(argc < 3) {
        printf("ERROR: Improper arguments specified, appropriate structure is: catgrepmore pattern
inputfile1 [...inputfile2...]\n");
        exit(EXIT_FAILURE);
    }

    signal(SIGINT, sighandler);
    signal(SIGPIPE, sigpipehandler);

    pattern = argv[1];

    for(int i = 2; i<argc; i++) {
```

```

int fd1pipe[2]; //grep
int fd2pipe[2]; //more

if (pipe(fd1pipe) < 0 || pipe(fd2pipe) < 0) {
    fprintf(stderr,"ERROR: Could not create Pipes:%s",strerror(errno));
    exit(EXIT_FAILURE);
}

if( (inputfile = open(argv[i], O_RDONLY))<0) {
    fprintf(stderr,"ERROR: Could not open file %s: %s\n", argv[i], strerror(errno));
    exit(EXIT_FAILURE);
}

pid_t grepPID, morePID;
int grepstatus, morestatus;

if((grepPID = fork()) < 0) {
    fprintf(stderr,"ERROR: Could not fork for grep command: %s\n", strerror(errno));
    exit(EXIT_FAILURE);
} else if(grepPID == 0) {

    if(inputfile!=0) {
        if((close(inputfile))<0) {
            fprintf(stderr,"ERROR: Could not close input file: %s\n", strerror(errno));
            exit(EXIT_FAILURE);
        }
    }

    if(close(fd1pipe[1]) < 0 || close(fd2pipe[0]) < 0) {
        fprintf(stderr,"ERROR: Could not close unused pipes in grep: %s\n", strerror(errno));
        exit(EXIT_FAILURE);
    }

    if((dup2(fd1pipe[0], 0) < 0) || (dup2(fd2pipe[1], 1) < 0)) {
        fprintf(stderr,"ERROR: Could not dup2 in grep: %s\n", strerror(errno));
        exit(EXIT_FAILURE);
    }

    if (close(fd1pipe[0]) < 0 || close(fd2pipe[1]) < 0) {
        fprintf(stderr,"ERROR: Could not close pipes in grep: %s\n", strerror(errno));
        exit(EXIT_FAILURE);
    }

    if(execlp("grep", "grep", pattern, NULL) < 0) {
        fprintf(stderr,"ERROR: Could not exec grep: %s\n", strerror(errno));
        exit(EXIT_FAILURE);
    }
}

if((morePID = fork()) == -1) {
    fprintf(stderr,"ERROR: Could not fork for 'more' command: %s\n", strerror(errno));

```

```

        exit(EXIT_FAILURE);
    } else if (morePID == 0) {

        if (inputfile != 0) {
            if ((close(inputfile)) < 0) {
                fprintf(stderr, "ERROR: Could not close input file: %s\n", strerror(errno));
                exit(EXIT_FAILURE);
            }
        }

        if (close(fd1pipe[1]) < 0 || close(fd1pipe[0]) < 0 || close(fd2pipe[1]) < 0) {
            fprintf(stderr, "ERROR: Could not close unused pipes in 'more': %s\n", strerror(errno));
            exit(EXIT_FAILURE);
        }

        if ((dup2(fd2pipe[0], 0) < 0)) {
            fprintf(stderr, "ERROR: Could not dup2 in 'more': %s\n", strerror(errno));
            exit(EXIT_FAILURE);
        }

        if (close(fd2pipe[0]) < 0) {
            fprintf(stderr, "ERROR: Could not close pipes in 'more': %s\n", strerror(errno));
            exit(EXIT_FAILURE);
        }

        if (execlp("more", "more", NULL) < 0) {
            fprintf(stderr, "ERROR: Could not exec 'more': %s\n", strerror(errno));
            exit(EXIT_FAILURE);
        }
    }

    if (grepPID != 0 && morePID != 0) {

        if (close(fd1pipe[0]) < 0 || close(fd2pipe[1]) < 0 || close(fd2pipe[0]) < 0) {
            fprintf(stderr, "ERROR: Could not close unused pipes in parent process: %s\n",
strerror(errno));
            exit(EXIT_FAILURE);
        }

        char buffer[bufferSize];
        while ((n = read(inputfile, buffer, sizeof(char)*bufferSize)) > 0) {
            if (n < 0) {
                fprintf(stderr, "ERROR: Could not read from input file %s:%s\n", argv[i],
strerror(errno));
                exit(EXIT_FAILURE);
            } else if (n == 0) {
                break;
            } else {
                int written = 0;
                while (written < n) {
                    if ((m = write(fd1pipe[1], buffer+written, n-written)) <= 0) {

```

```

        if(errno==EPIPE) {
            break;
        }
        fprintf(stderr, "ERROR: Could not write end of pipe 1:%s\n",
strerror(errno));
        exit(EXIT_FAILURE);
    }
    written += m;
}
processedbytes = written;
}
}

if(close(fd1pipe[1]) < 0 ) {
    fprintf(stderr,"ERROR: Could not close unused pipes in parent process: %s\n",
strerror(errno));
    exit(EXIT_FAILURE);
}

if(inputfile!=0) {
    if((close(inputfile))<0) {
        fprintf(stderr,"ERROR: Could not close input file: %s\n", strerror(errno));
        exit(EXIT_FAILURE);
    }
}

if (waitpid(grepPID, &grepstatus, 0)<0|| waitpid(morePID, &morestatus, 0) < 0) {
    fprintf(stderr,"ERROR: Error in waiting for child process: %s\n", strerror(errno));
    exit(EXIT_FAILURE);
}

if(grepstatus!=0) {
    if(WIFSIGNALED(grepstatus) && WTERMSIG(morestatus)!=SIGPIPE) {
        fprintf(stderr, "Signal number that caused grep to terminate: %d\n",
WTERMSIG(morestatus));
    }
} else {
    if(WIFEXITED(grepstatus)) {
        fprintf(stderr, "Grep Exit Status is: %d\n", WEXITSTATUS(grepstatus));
    }
}

if(morestatus!=0) {
    if(WIFSIGNALED(morestatus) && WTERMSIG(morestatus)!=SIGPIPE) {
        fprintf(stderr, "Signal number that caused 'more' to terminate: %d\n",
WTERMSIG(morestatus));
    }
} else {
    if(WIFEXITED(grepstatus)) {

```

```
        fprintf(stderr, "'more' Exit Status is: %d\n", WEXITSTATUS(morestatus));
    }
}
    }
    processedfiles++;
}
return 0;
}
```

### **Screenshots of catgrepmore in action:**

\*note that filetwo.txt is about dogs and fileone.txt is about cats

```
nithi@nythy: ~/Documents
File Edit View Search Terminal Help
nithi@nythy:~$ cd Documents
nithi@nythy:~/Documents$ gcc catgrepmore.c
nithi@nythy:~/Documents$ ./a.out the filetwo.txt fileone.txt
```

after enter is hit →

```
nithi@nythy: ~/Documents
File Edit View Search Terminal Help
From Wikipedia, the free encyclopedia
This article is about the domestic dog. For related species known as "dogs", see Canidae. For other uses, see Dog (disambiguation).
"Doggie" redirects here. For the Danish artist, see Doggie (artist).
Selection of the different breeds of dog
The domestic dog (Canis lupus familiaris when considered a subspecies of the wolf or Canis familiaris when considered a distinct species)[4] is a member of the genus Canis (canines), which forms part of the wolf-like canids,[5] and is the most widely abundant terrestrial carnivore.[6][7][8][9][10] The dog and the extant gray wolf are sister taxa[11][12][13] as modern wolves are not closely related to the wolves that were first domesticated,[12][13] which implies that the direct ancestor of the dog is extinct.[14] The dog was the first species to be domesticated[13][15] and has been selectively bred over millennia for various behaviors, sensory capabilities, and physical attributes.[16]
Their long association with humans has led dogs to be uniquely attuned to human behavior[17] and they are able to thrive on a starch-rich diet that would be inadequate for other canid species.[18] Dogs vary widely in shape, size and colors.[19] Dogs perform many roles for people, such as hunting, herding, pulling loads, protection, assisting police and military, companionship and, more recently, aiding handicapped individuals and therapeutic roles. This influence on human society has given them the sobriquet "man's best friend".
14 Further reading
The term dog typically is applied both to the species (or subspecies) as a whole, and any adult male member of the same.
An adult female capable of reproduction is a brood bitch, or brood mother.
A group of pups from the same gestation period is a litter.
The father of a litter is a sire. It is possible for one litter to have multiple sires.
The mother of a litter is a dam.
In 1999, a study of mitochondrial DNA indicated that the domestic dog may have originated from multiple grey wolf populations, with the dingo and New Guinea singing dog "breeds" having developed at a time when human populations were more isolated from each other.[20] In the third edition of Mammal Species of the World published in 2005, the mammalogist W. Christopher Mowson listed under the wolf Canis lupus its wild subspecies, and proposed two additional subspecies: "familiaris Linnaeus, 1758 [domestic dog]" and "dingo Meyer, 1793 [domestic dog]". Mowson included hallstromi - the New Guinea singing dog - as a taxonomic synonym for the dingo. Mowson referred to the mtDNA study as one of the guides in forming his decision.[1] The inclusion of familiaris and dingo under a "domestic dog" clade has been noted by other mammalogists.[21] This classification by Mowson is debated among zoologists.[22]
See further Taxonomic debate - dog, dingo, and New Guinea singing dog
Main article: Origin of the domestic dog
The origin of the domestic dog is not clear. It is known that the dog was the first domesticated species.[13][15] The domestic dog is a member of the genus Canis (canines), which forms part of the wolf-like canids,[5] and is the most widely abundant terrestrial carnivore.[6][7][8][9][10] The closest living relative of the dog is the gray wolf and there is no evidence of any other canine contributing to its genetic lineage.[7][8][23][11] The dog and the extant gray wolf form two sister clades,[11][12][13] with modern wolves not closely related to the wolves that were first domesticated.[12][13] The archaeological record shows the first undisputed dog remains buried beside humans 14,700 years ago,[24] with disputed remains occurring 36,000 years ago.[25] These dates imply that the earliest dogs arose in the time of human hunter-gatherers and not at the dawn of agriculture.[8][12]
Where the genetic divergence of dog and wolf took place remains controversial, with the most plausible proposals spanning Western Europe,[26][8] Central Asia,[26][27] and East Asia.[26][28] This has been made more complicated by the most recent proposal that fits the available evidence, which is that an initial wolf population split into East and West Eurasian wolves, these were then domesticated independently before going extinct into two distinct dog populations between 14,000-6,400 years ago, and then the Western Eurasian dog population was partially and gradually replaced by East Asian dogs that were brought by humans at least 6,400 years ago.[26][29][30] Domestic dogs have been selectively bred for millennia for various behaviors, sensory capabilities, and physical attributes.[16] Modern dog breeds show more variation in size, appearance, and behavior than any other domestic animal.[16] Dogs are predators and scavengers, and like many other predatory mammals, the dog has powerful mu
--More--
```

after q is hit →

```
nithi@nythy: ~/Documents
File Edit View Search Terminal Help
This is a good article. Follow the link for more information.
From Wikipedia, the free encyclopedia
This article is about the cat species that is commonly kept as a pet. For the cat family, see Felidae. For other uses, see Cat (disambiguation) and Cats (disambiguation).
For technical reasons, "Cat #1" redirects here. For the album, see Cat 1 (album).
The cat (Felis catus, or Felis silvestris catus, literally "woodland cat"),[4][1][5] often referred to as the domestic cat to distinguish from other felids and felines, is a small, typically furry, carnivorous mammal. It is often called house cat[6] when kept as indoor pet or feral/feral domestic cat when wild.[7] It is often valued by humans for companionship and for its ability to hunt vermin. There are more than seventy cat breeds recognized by various cat registries.
Cats are similar in anatomy to the other felids, with a strong flexible body, quick reflexes, sharp teeth and retractable claws adapted to killing small prey. Cat senses fit a crepuscular and predatory ecological niche. Cats can hear sounds too faint or too high in frequency for human ears, such as those made by mice and other small animals. They can see in near darkness. Like most other mammals, cats have poorer color vision and a better sense of smell than humans. Cats, despite being solitary hunters, are a social species, and cat communication includes the use of a variety of vocalizations (mewing, purring, trilling, hissing, growling and grunting) as well as cat pheromones and types of cat-specific body language.[8]
Cats have a high breeding rate.[9] Under controlled breeding, they can be bred and shown as registered pedigree pets, a hobby known as cat fancy. Failure to control the breeding of pet cats by spaying and neutering, as well as the abandonment of former household pets, has resulted in large numbers of feral cats worldwide, requiring population control.[10] In certain areas outside cats' native range, this has contributed, along with habitat destruction and other factors, to the extinction of many bird species. Cats have been known to extirpate a bird species within specific regions and may have contributed to the extinction of isolated island populations.[11] Cats are thought to be primarily responsible for the extinction of 87 species of birds,[12] and the presence of feral and free-ranging cats makes some otherwise suitable locations unsuitable for attempted species reintroduction.[13]
Because cats were venerated in ancient Egypt, they were commonly believed to have been domesticated there,[14] but there may have been instances of domestication as early as the Neolithic from around 9,500 years ago (7500 BC).[15] Results of a genetic study in 2007 showed that all domestic cats descended from the Near Eastern wildcat and diverged around 8000 BC in the Middle East.[16][14][17] The leopard cat was domesticated independently in China around 5500 BC, though this line of partially domesticated cats leaves no trace in the domesticated populations of today.[18][19] A 2017 study confirmed that domestic cats are descendants of those first domesticated by farmers in the Near East around 9,000 years ago.[20][21]
As of a 2007 study, cats are the second-most popular pet in the U.S. by number of pets owned, after freshwater fish.[22] In a 2010 study, they were ranked the third-most popular pet in the UK, after fish and dogs, with around 8 million being owned.[23]
The domestic cat is a member of the cat family, the felids, which are a rapidly evolving family of mammals that share a common ancestor only 10–15 million years ago[24] and include lions, tigers, cougars and many others. Within this family, domestic cats (Felis catus) are part of the genus Felis, which is a group of small cats containing about seven species (depending upon classification scheme).[1][25] Members of the genus are found worldwide and include the jungle cat (Felis chaus) of southeast Asia, European wildcat (F. silvestris silvestris), African wildcat (F. s. lybica), the Chinese mountain cat (F. bieti), and the Arabian sand cat (F. margarita), among others.[26]
The domestic cat is believed to have evolved from the Near Eastern wildcat, whose range covers vast portions of the Middle East westward to the Atlantic coast of Africa.[27][28] Between 70,000 and 100,000 years ago the animal gave rise to the genetic lineage that eventually produced all domesticated cats,[29] having diverged from the Near Eastern wildcat around 8,000 BC in the Middle East.[14][17]
The domestic cat was first classified as Felis catus by Carl Linnaeus in the 10th edition of his Systema Naturae published in 1758.[1][2] Because of modern phylogenetics, domestic cats are usually regarded as another subspecies of the wildcat, F. silvestris.[1][30][31] This has resulted in mixed usage of the terms, as the domestic cat can be called by its subspecies name, Felis silvestris catus.[1][30][31] Wildcats have also been referred to as various subspecies of F. catus,[31] but in 2003, the International Commission on Zoological Nomenclature fixed the name for wildcats as F. silvestris.[32] The most common name in use for the domestic cat remains F. catus. Sometimes, the domestic cat has been called Felis domesticus[33] as proposed by German naturalist J. C. P. Erxleben in 1777,[34] but these are not valid taxonomic names.
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```

after control c is hit →

```
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File Edit View Search Terminal Help
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Process interrupted by SIGINT
Files processed: 1 with 2852 bytes
nithi@nythy:~/Documents$
```