Mark Kim ID: 918204214
Github: mkim797 CSC415 Operating Systems

Assignment 5 – Buffered I/O

Description:
This assignment is to write a C program that loads files into a file control block array to be read and copied into a caller's buffer. When files are loaded from the file control block, they are loaded into the fcb buffer one 512 block at a time. Once loaded, the caller's buffer is filled from the caller's request.

Approach / What I Did:
I have programmed this assignment multiple times with different approaches. First, I did some basic code to just load the file into a single block to be read with print statements to see the behavior of the different functions provided. Unfortunately, we were not provided full specifications for the function that this assignment hinges upon: LBAread, so quite a bit of testing was necessary to figure out what it returned and how it behaved with file reads. For example, it was unclear as to whether it would return only the number of bytes remaining in a file or if the file byte count needed to be tracked from our end.

I then diagrammed out the logic necessary to handle the fcb array, the reads, and the buffer. Once I completed that, I turned to starting the coding. As I coded, I revised and revisited my diagrams and notes as I ran into new hurdles. I also visited office hours and found some new approaches to the assignment.

Logically speaking, if the requested data count exceeds the amount left in the file, we should only return what is left in the file. After this, there are two cases: the requested amount is less than or equal to the amount left in the fcb buffer or greater than what is left in the buffer. If less, we simply copy over the requested amount and increment the buffer offset. If greater, we need to copy over whatever is left in the buffer and handle what is left in the request. This is done by calculating how many blocks the request needs and then copying over full blocks until only a partial block is left (if there is a partial block). Then lastly, whatever is left is copied over.

In the end, I scrapped my code multiple times to recode the assignment from scratch to try to solve some issues. I have two versions of the assignment in two different branches (the main branch is my submission) which behave almost identically (the other version is in the "test" branch).

During all this time, I did some pair-programming with another student in the class to assist in reasoning out anything that I may have forgotten.

Issues and Resolutions:

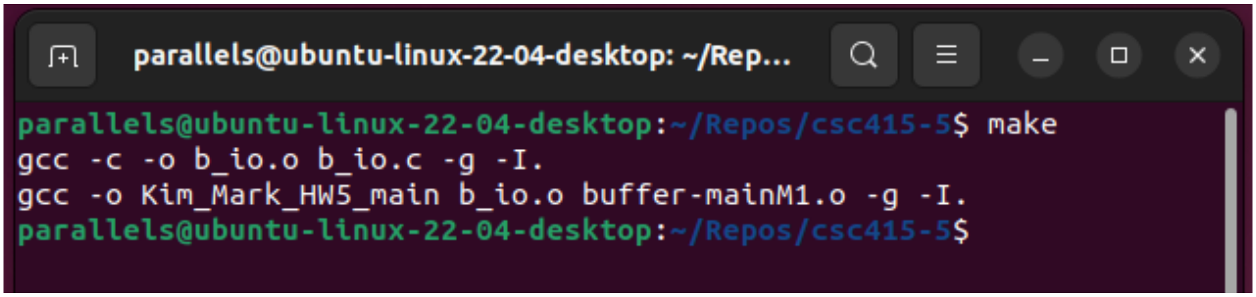
This is not really an issue since this happened during my exploratory stage for the assignment, but in the beginning, no data was being copied over.

As I continued progressing, I ran into the issue of the program not reading and copying over all the data. This was resolved by writing out all the cases that I needed to handle. After writing all the cases, I was able to reason out the cases that I forgot to include. After this, the code pretty much wrote itself.

Even after I resolved most of the issues, I scrapped all my code and tried to reimplement the program in a different way (again in the "test" branch).

Analysis: None required

Screen shot of compilation:



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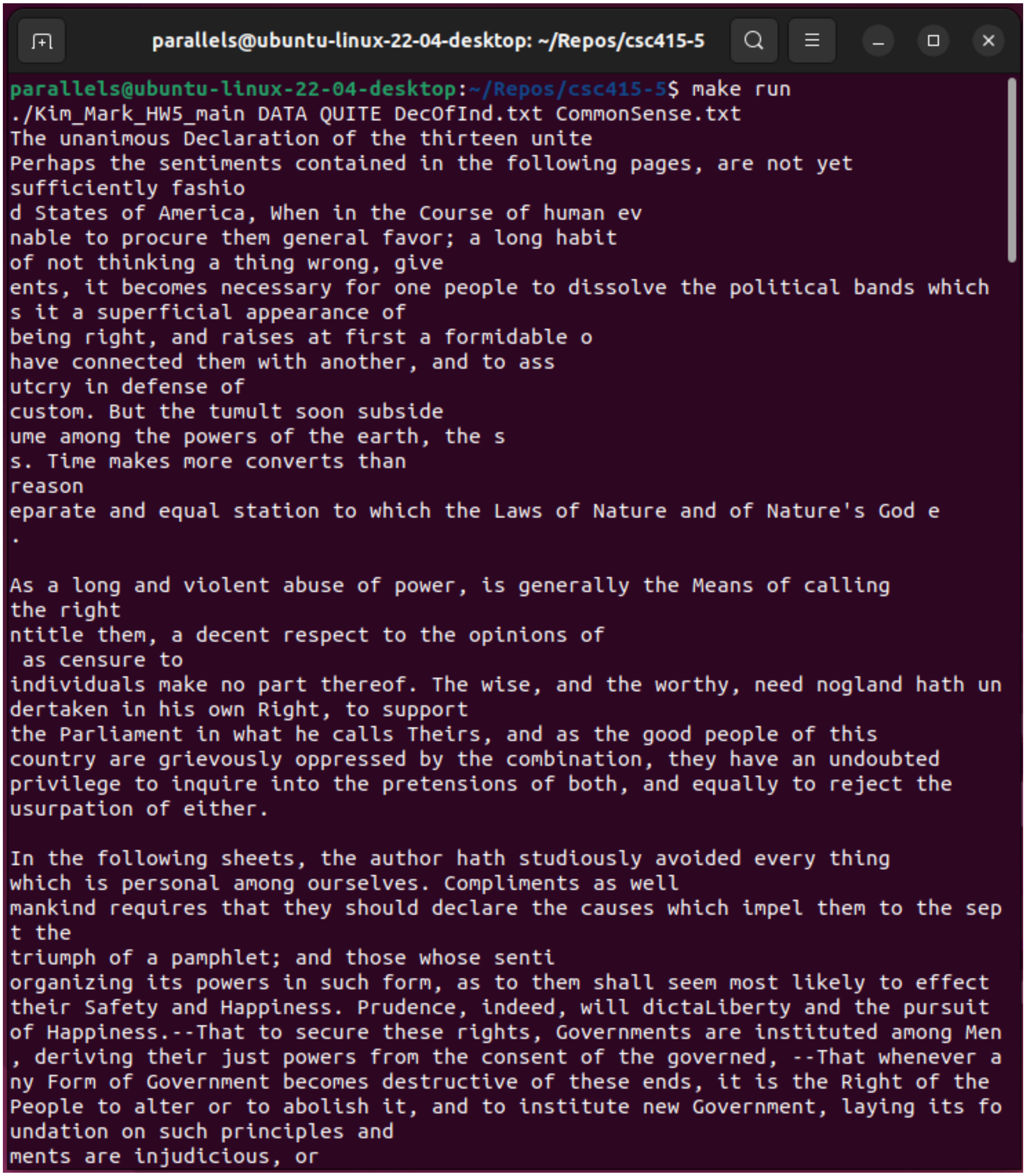
parallels@ubuntu-linux-22-04-desktop:~/Repos/csc415-5$ make
gcc -c -o b_io.o b_io.c -g -I.
gcc -o Kim_Mark_HW5_main b_io.o buffer-mainM1.o -g -I.
parallels@ubuntu-linux-22-04-desktop:~/Repos/csc415-5$
```

SCREENSHOTS OF EXECUTION ON SUBSEQUENT PAGES

Screen shot(s) of the execution of the program:



```
parallels@ubuntu-linux-22-04-desktop:~/Repos/csc415-5$ make run
./Kim_Mark_HW5_main DATA QUITE DecOfInd.txt CommonSense.txt
The unanimous Declaration of the thirteen unite
Perhaps the sentiments contained in the following pages, are not yet
sufficiently fashio
d States of America, When in the Course of human ev
nable to procure them general favor; a long habit
of not thinking a thing wrong, give
ents, it becomes necessary for one people to dissolve the political bands which
s it a superficial appearance of
being right, and raises at first a formidable o
have connected them with another, and to ass
utcry in defense of
custom. But the tumult soon subside
ume among the powers of the earth, the s
s. Time makes more converts than
reason
eparate and equal station to which the Laws of Nature and of Nature's God e
.

As a long and violent abuse of power, is generally the Means of calling
the right
ntitle them, a decent respect to the opinions of
 as censure to
individuals make no part thereof. The wise, and the worthy, need nogland hath un
dertaken in his own Right, to support
the Parliament in what he calls Theirs, and as the good people of this
country are grievously oppressed by the combination, they have an undoubted
privilege to inquire into the pretensions of both, and equally to reject the
usurpation of either.

In the following sheets, the author hath studiously avoided every thing
which is personal among ourselves. Compliments as well
mankind requires that they should declare the causes which impel them to the sep
t the
triumph of a pamphlet; and those whose senti
organizing its powers in such form, as to them shall seem most likely to effect
their Safety and Happiness. Prudence, indeed, will dictaLiberty and the pursuit
of Happiness.--That to secure these rights, Governments are instituted among Men
, deriving their just powers from the consent of the governed, --That whenever a
ny Form of Government becomes destructive of these ends, it is the Right of the
People to alter or to abolish it, and to institute new Government, laying its fo
undation on such principles and
ments are injudicious, or
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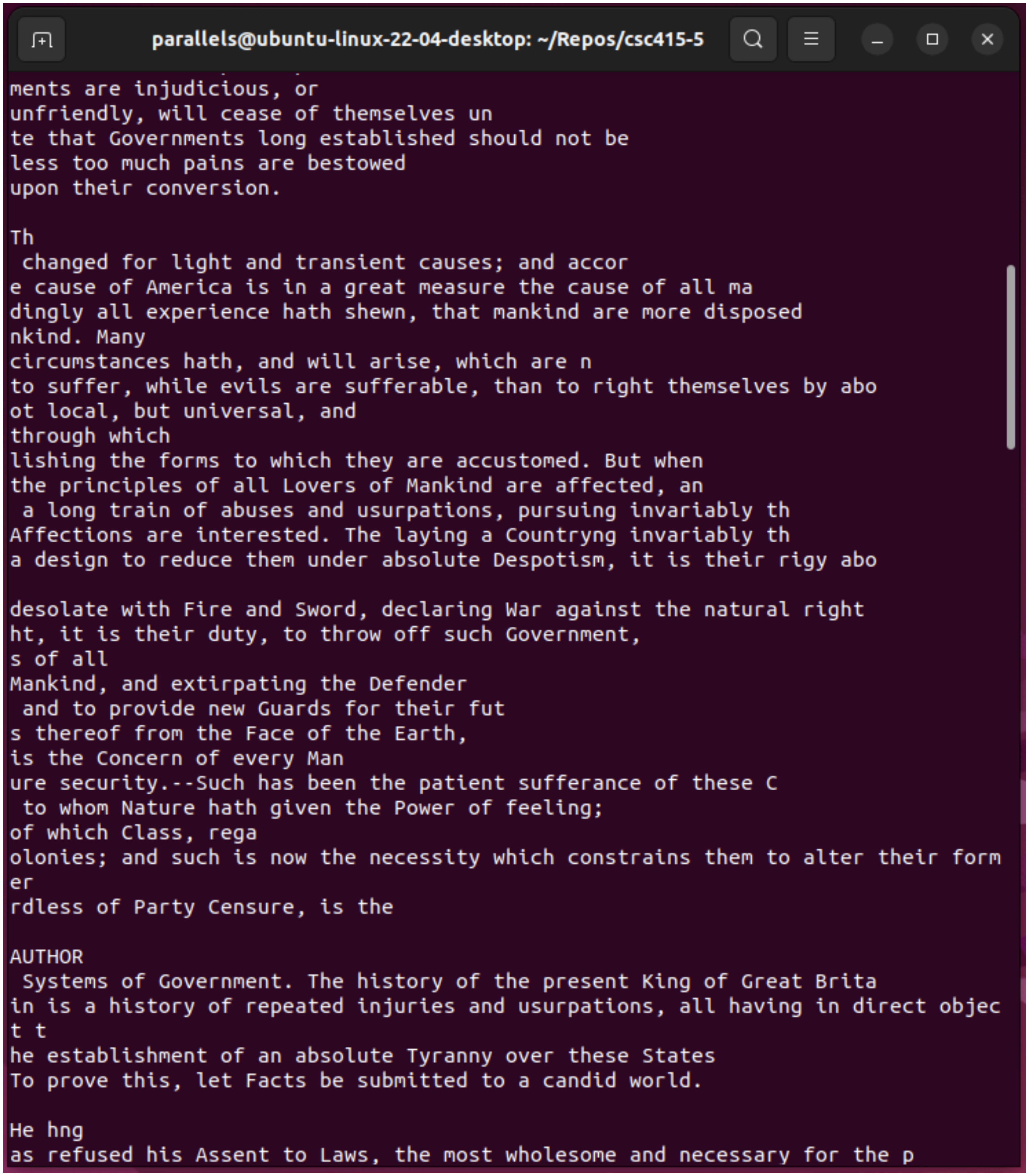

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ments are injudicious, or
unfriendly, will cease of themselves un
te that Governments long established should not be
less too much pains are bestowed
upon their conversion.

Th
 changed for light and transient causes; and accor
e cause of America is in a great measure the cause of all ma
dingly all experience hath shewn, that mankind are more disposed
nkind. Many
circumstances hath, and will arise, which are n
to suffer, while evils are sufferable, than to right themselves by abo
ot local, but universal, and
through which
lishing the forms to which they are accustomed. But when
the principles of all Lovers of Mankind are affected, an
 a long train of abuses and usurpations, pursuing invariably th
Affections are interested. The laying a Countryng invariably th
a design to reduce them under absolute Despotism, it is their rigy abo

desolate with Fire and Sword, declaring War against the natural right
ht, it is their duty, to throw off such Government,
s of all
Mankind, and extirpating the Defender
 and to provide new Guards for their fut
s thereof from the Face of the Earth,
is the Concern of every Man
ure security.--Such has been the patient sufferance of these C
 to whom Nature hath given the Power of feeling;
of which Class, rega
olonies; and such is now the necessity which constrains them to alter their form
er
rdless of Party Censure, is the

AUTHOR
 Systems of Government. The history of the present King of Great Brita
in is a history of repeated injuries and usurpations, all having in direct objec
t t
he establishment of an absolute Tyranny over these States
To prove this, let Facts be submitted to a candid world.

He hng
as refused his Assent to Laws, the most wholesome and necessary for the p
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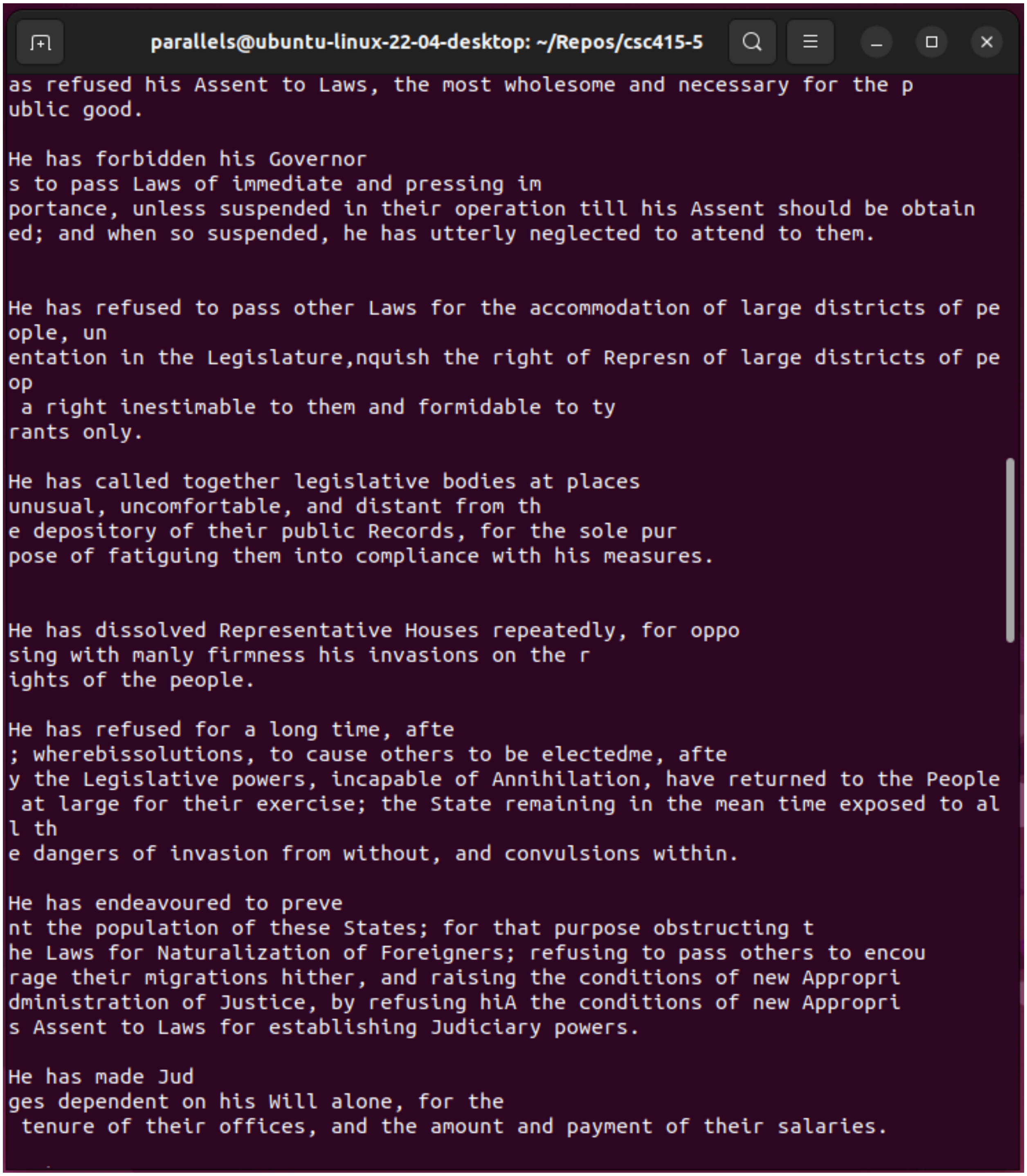

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as refused his Assent to Laws, the most wholesome and necessary for the p
ublic good.

He has forbidden his Governor
s to pass Laws of immediate and pressing im
portance, unless suspended in their operation till his Assent should be obtain
ed; and when so suspended, he has utterly neglected to attend to them.


He has refused to pass other Laws for the accommodation of large districts of pe
ople, un
entation in the Legislature,nquish the right of Represn of large districts of pe
op
 a right inestimable to them and formidable to ty
rants only.

He has called together legislative bodies at places
unusual, uncomfortable, and distant from th
e depository of their public Records, for the sole pur
pose of fatiguing them into compliance with his measures.


He has dissolved Representative Houses repeatedly, for oppo
sing with manly firmness his invasions on the r
ights of the people.

He has refused for a long time, afte
; wherebissolutions, to cause others to be electedme, afte
y the Legislative powers, incapable of Annihilation, have returned to the People
 at large for their exercise; the State remaining in the mean time exposed to al
l th
e dangers of invasion from without, and convulsions within.

He has endeavoured to preve
nt the population of these States; for that purpose obstructing t
he Laws for Naturalization of Foreigners; refusing to pass others to encou
rage their migrations hither, and raising the conditions of new Appropri
dministration of Justice, by refusing hiA the conditions of new Appropri
s Assent to Laws for establishing Judiciary powers.

He has made Jud
ges dependent on his Will alone, for the
 tenure of their offices, and the amount and payment of their salaries.
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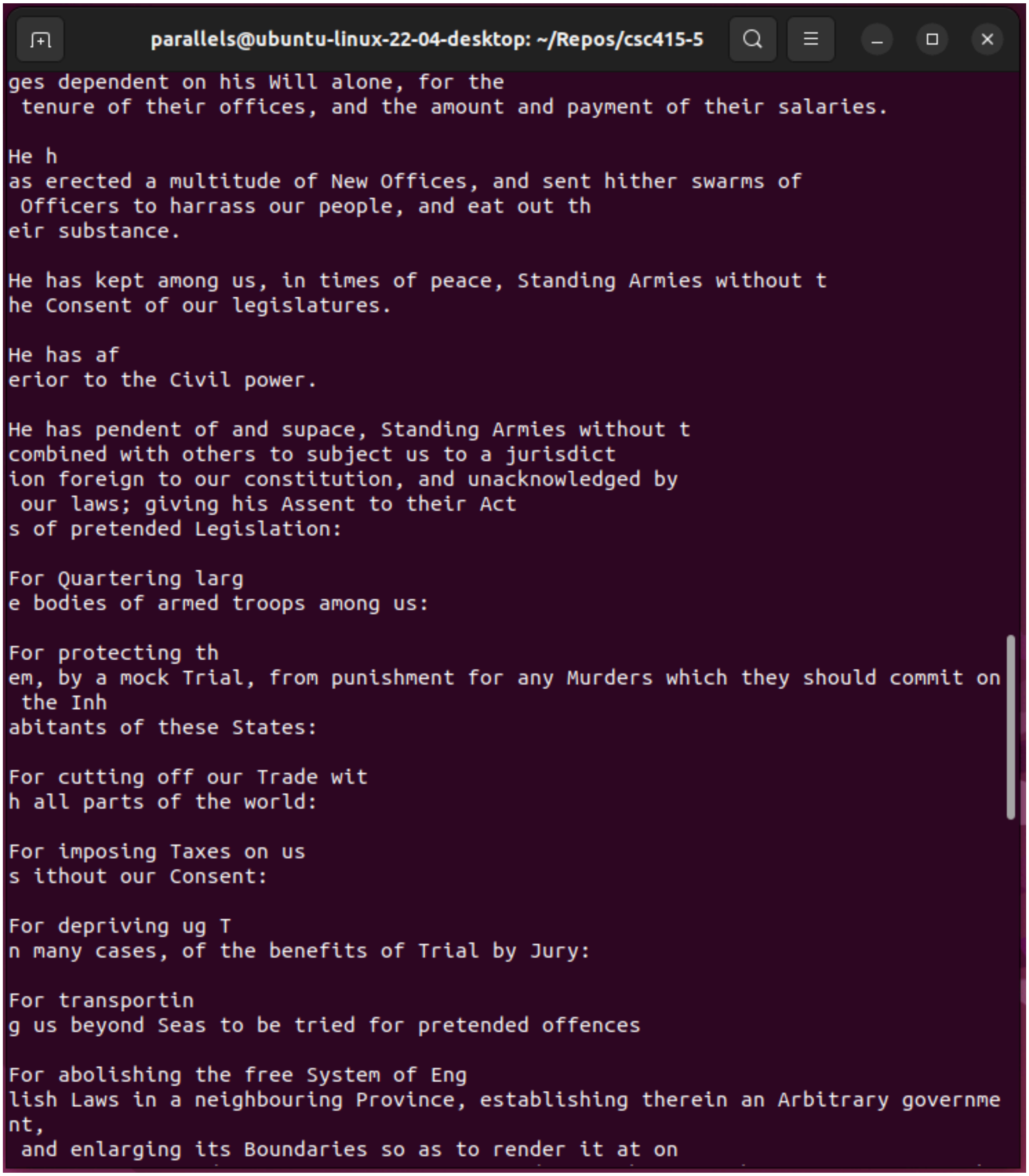

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ges dependent on his Will alone, for the
 tenure of their offices, and the amount and payment of their salaries.

He h
as erected a multitude of New Offices, and sent hither swarms of
 Officers to harrass our people, and eat out th
eir substance.

He has kept among us, in times of peace, Standing Armies without t
he Consent of our legislatures.

He has af
erior to the Civil power.

He has pendent of and supace, Standing Armies without t
combined with others to subject us to a jurisdict
ion foreign to our constitution, and unacknowledged by
 our laws; giving his Assent to their Act
s of pretended Legislation:

For Quartering larg
e bodies of armed troops among us:

For protecting th
em, by a mock Trial, from punishment for any Murders which they should commit on
 the Inh
abitants of these States:

For cutting off our Trade wit
h all parts of the world:

For imposing Taxes on us
s ithout our Consent:

For depriving ug T
n many cases, of the benefits of Trial by Jury:

For transportin
g us beyond Seas to be tried for pretended offences

For abolishing the free System of Eng
lish Laws in a neighbouring Province, establishing therein an Arbitrary governme
nt,
 and enlarging its Boundaries so as to render it at on
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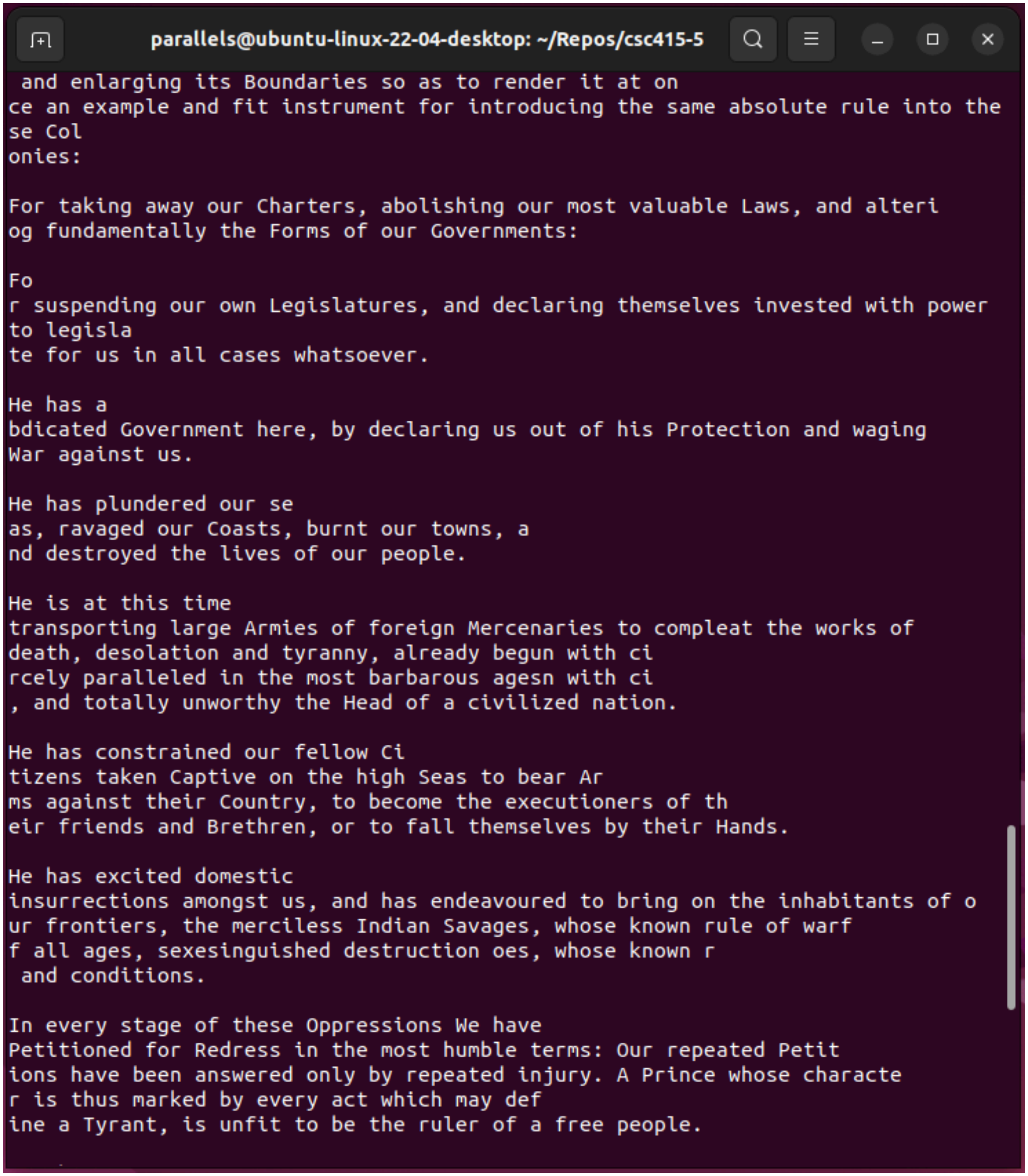

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 and enlarging its Boundaries so as to render it at on
ce an example and fit instrument for introducing the same absolute rule into the
se Col
onies:

For taking away our Charters, abolishing our most valuable Laws, and alteri
og fundamentally the Forms of our Governments:

Fo
r suspending our own Legislatures, and declaring themselves invested with power
to legisla
te for us in all cases whatsoever.

He has a
bdicated Government here, by declaring us out of his Protection and waging
War against us.

He has plundered our se
as, ravaged our Coasts, burnt our towns, a
nd destroyed the lives of our people.

He is at this time
transporting large Armies of foreign Mercenaries to compleat the works of
death, desolation and tyranny, already begun with ci
rcely paralleled in the most barbarous agesn with ci
, and totally unworthy the Head of a civilized nation.

He has constrained our fellow Ci
tizens taken Captive on the high Seas to bear Ar
ms against their Country, to become the executioners of th
eir friends and Brethren, or to fall themselves by their Hands.

He has excited domestic
insurrections amongst us, and has endeavoured to bring on the inhabitants of o
ur frontiers, the merciless Indian Savages, whose known rule of warf
f all ages, sexesinguished destruction oes, whose known r
 and conditions.

In every stage of these Oppressions We have
Petitioned for Redress in the most humble terms: Our repeated Petit
ions have been answered only by repeated injury. A Prince whose characte
r is thus marked by every act which may def
ine a Tyrant, is unfit to be the ruler of a free people.
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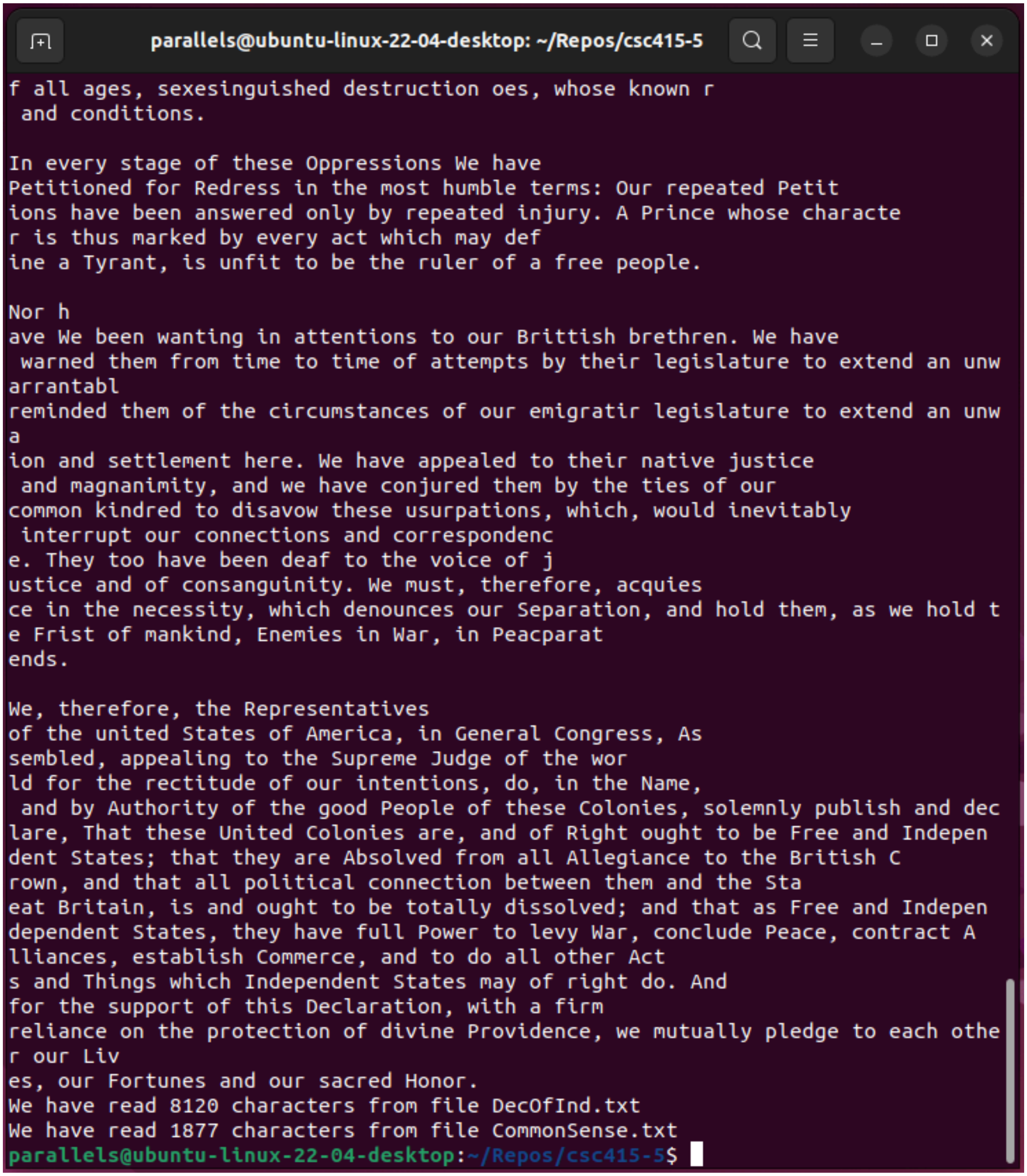

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r is thus marked by every act which may def
ine a Tyrant, is unfit to be the ruler of a free people.

Nor h
ave We been wanting in attentions to our Brittish brethren. We have
 warned them from time to time of attempts by their legislature to extend an unw
arrantabl
reminded them of the circumstances of our emigratir legislature to extend an unw
a
ion and settlement here. We have appealed to their native justice
 and magnanimity, and we have conjured them by the ties of our
common kindred to disavow these usurpations, which, would inevitably
 interrupt our connections and correspondenc
e. They too have been deaf to the voice of j
ustice and of consanguinity. We must, therefore, acquies
ce in the necessity, which denounces our Separation, and hold them, as we hold t
e Frist of mankind, Enemies in War, in Peacparat
ends.

We, therefore, the Representatives
of the united States of America, in General Congress, As
sembled, appealing to the Supreme Judge of the wor
ld for the rectitude of our intentions, do, in the Name,
 and by Authority of the good People of these Colonies, solemnly publish and dec
lare, That these United Colonies are, and of Right ought to be Free and Indepen
dent States; that they are Absolved from all Allegiance to the British C
rown, and that all political connection between them and the Sta
eat Britain, is and ought to be totally dissolved; and that as Free and Indepen
dependent States, they have full Power to levy War, conclude Peace, contract A
lliances, establish Commerce, and to do all other Act
s and Things which Independent States may of right do. And
for the support of this Declaration, with a firm
reliance on the protection of divine Providence, we mutually pledge to each othe
r our Liv
es, our Fortunes and our sacred Honor.
We have read 8120 characters from file DecOfInd.txt
We have read 1877 characters from file CommonSense.txt
parallels@ubuntu-linux-22-04-desktop:~/Repos/csc415-5$ 
```