CSc 120
Introduction to Computer Programming II

CODE EXAMPLES 03 

Some code from assg 4

```
"""
    File:    biodiversity.py
    Author:  Saumya Debray
    Purpose: Compute and print out biodiversity information about US National
             Parks.
"""
```

Data structure:

{ park_name : (area , [flora_count, fauna_count]),
  … }

0 1

Programming problem:

Map species categories ('Bird', 'Mammal', etc.) to an index value (0 or 1) in a quick, simple, and readable way.

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             Parks.
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### Positions of flora and fauna counts in the lists that keep track of the
### counts for each park.
FLORA = 0
FAUNA = 1

### Mapping from categories in the input to flora/fauna
CATEGORIES = { 'Algae' : FLORA,
               'Fungi' : FLORA,
               'Nonvascular Plant' : FLORA,
               'Vascular Plant' : FLORA,
               'Amphibian' : FAUNA,
               'Bird' : FAUNA,
               'Crab/Lobster/Shrimp' : FAUNA,
               'Fish' : FAUNA,
               'Insect' : FAUNA,
               'Invertebrate' : FAUNA,
               'Mammal' : FAUNA,
               'Reptile' : FAUNA,
               'Slug/Snail' : FAUNA,
               'Spider/Scorpion' : FAUNA }
```

constants

```
def main():
    """Process and print biodiversity information for national parks.

    Parameters: none

    Returns: none

    Pre-condition: none

    Post-condition: bio-diversity information printed out
    """

    info = read_biodiversity_info()
    print_biodiversity_info(info)
```

```
def read_biodiversity_info():
    """Read bio-diversity information from files and organize the data into a
       dictionary.

    Parameters: none

    Returns: A dictionary mapping national park names to their area and
        flora and fauna counts.

    Pre-condition: none

    Post-condition: The dictionary returned contains park area and
        flora and fauna information from the input files.
    """

    info_dict = {}

    # read park information
    pfile_name = input()
    pfile = open(pfile_name)

    for line in pfile:
        if line[0] == '#':
            continue

        park_info = line.split(',')

        assert len(park_info) == 5

        park_name = park_info[0]
        park_area = int(park_info[2])

        info_dict[park_name] = (park_area, [0,0])

    pfile.close()

    # read species information
    sfile_name = input()
    sfile = open(sfile_name)

    for line in sfile:
        if line[0] == '#':
            continue

        species_info = line.split(',')

        assert len(species_info) >= 3

        park_name = species_info[0]
        species_category = CATEGORIES[species_info[1]]

        if park_name in info_dict:
            park_biodiversity_info = info_dict[park_name][1]
            park_biodiversity_info[species_category] += 1

    sfile.close()

    return info_dict
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    # read par
    pfile_name
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    for line i
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        park_i

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        park_a

        info_d

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    if park_name in info_dict:
        park_biodiversity_info = info_dict[park_name][1]
        park_biodiversity_info[species_category] += 1

sfile.close()

return info_dict
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Can this repetition be eliminated?

```
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    park_name = species_info[0]
    species_category = CATEGORIES[species_info[1]]

    if park_name in info_dict:
        park_biodiversity_info = info_dict[park_name][1]
        park_biodiversity_info[species_category] += 1

sfile.close()

return info_dict
```

```
def print_biodiversity_info(info):
    """Print out the bio-diversity density (per acre) of each national park

    Parameters: info is a dictionary mapping park names to area and
        flora/fauna counts

    Returns: none

    Pre-condition: info is a dictionary

    Post-condition: bio-diversity information printed out
    """

    assert type(info) == dict

    for park in info:
        area = info[park][0]
        flora = info[park][1][FLORA]
        fauna = info[park][1][FAUNA]

        assert area > 0 andflora >= 0 and fauna >= 0

        flora_density = flora/area
        fauna_density = fauna/area

        if flora == 0 and fauna == 0:
            print("{} -- no data available".format(park))
        else:
            print("{} -- flora: {:f} per acre; fauna: {:f} per acre".\
                  format(park, flora_density, fauna_density))
```

Some style comments

```
sinfo = input()
sinfo = open(sinfo).readlines()
for i in range(len(sinfo))
    sinfo[i] = sinfo[i].split(',')
    if sinfo[i][0][0] == '#':
        continue
    else:
        if sinfo[i][1] in fauna and
           sinfo[i][0] in parks:
                parks[sinfo[i][0]][1][1] += 1
        elif …
```

same variable used for completely different types of objects

```
sinfo = input()
sinfo = open(sinfo).readlines()
for i in range(len(sinfo))
    sinfo[i] = sinfo[i].split(',')
    if sinfo[i][0][0] == '#':
        continue
    else:
        if sinfo[i][1] in fauna and
           sinfo[i][0] in parks:
                parks[sinfo[i][0]][1][1] += 1
        elif …
```

Better: use different variable names to indicate different usage

```
sinfo = input()
sinfo = open(sinfo).readlines()
for i in range(len(sinfo))
    sinfo[i] = sinfo[i].split(',')
    if sinfo[i][0][0] == '#':
        continue
    else:
        if sinfo[i][1] in fauna and
           sinfo[i][0] in parks:
                parks[sinfo[i][0]][1][1] += 1
        elif …
```

```
sinfo = input()
sinfo = open(sinfo).readlines()
for i in range(len(sinfo))
    sinfo[i] = sinfo[i].split(',')
    if sinfo[i][0][0] == '#':
        continue
    else:  # not necessary
        if sinfo[i][1] in fauna and
           sinfo[i][0] in parks:
                parks[sinfo[i][0]][1][1] += 1
        elif …
```

```
sinfo = input()
sinfo = open(sinfo).readlines()
for i in range(len(sinfo))
    sinfo[i] = sinfo[i].split(',')
    if sinfo[i][0][0] == '#':
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    if sinfo[i][1] in fauna and
       sinfo[i][0] in parks:
            parks[sinfo[i][0]][1][1] += 1
    elif …
```

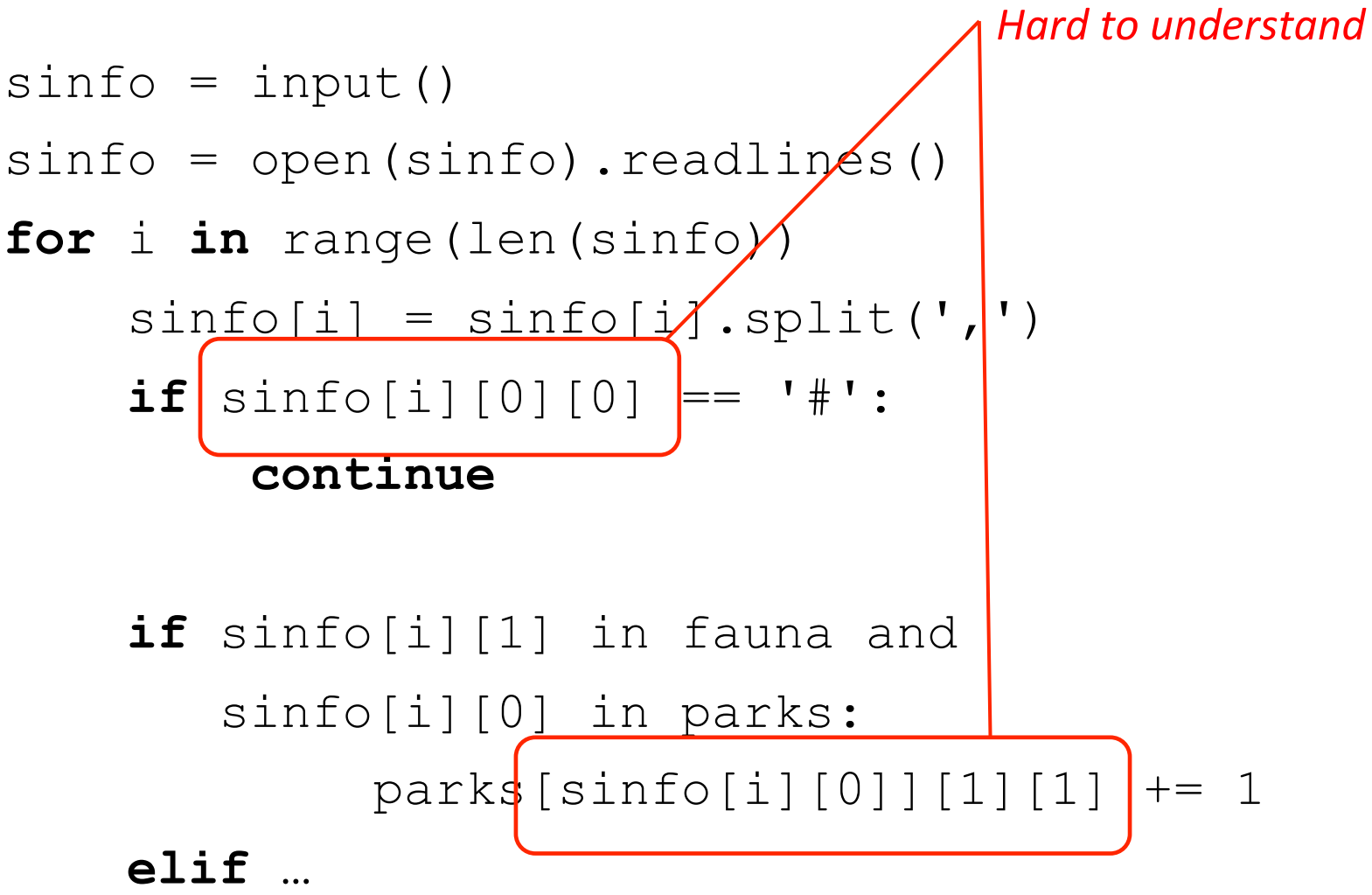
Hard to understand
sinfo = input()
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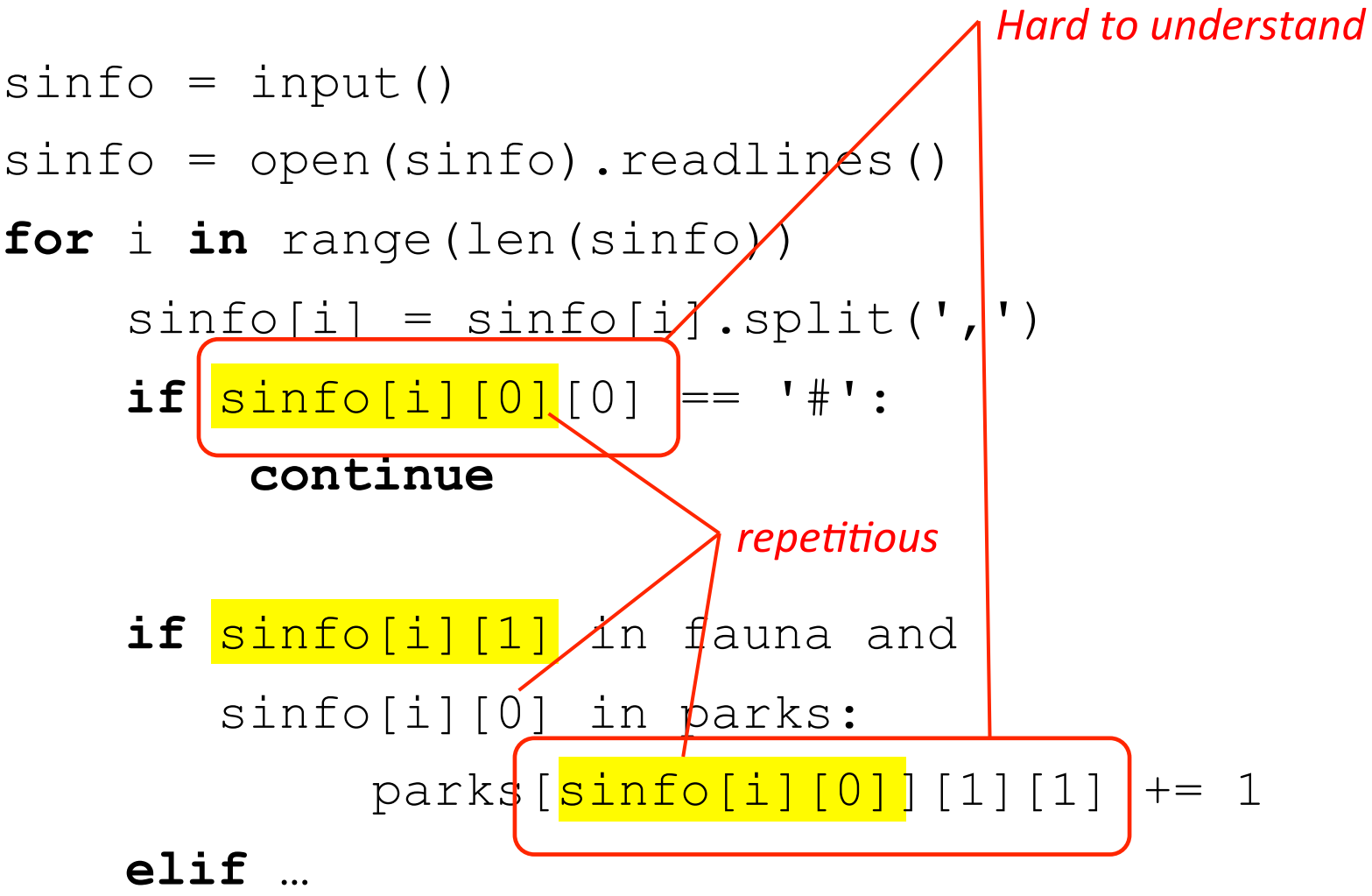
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parks[sinfo[i][0]][1][1] += 1
elif …

Use meaningful variable names to make operations on complex structures easier to understand

```
sinfo = input()
sinfo = open(sinfo).readlines()
for i in range(len(sinfo))
    sinfo[i] = sinfo[i].split(',')
    park_name = sinfo[i][0]
    if park_name[0] == '#':
        continue

    if sinfo[i][1] in fauna and
       park_name in parks:
            parks[park_name][1][1] += 1
    elif …
```

No need for readlines()
Eliminate the indexing

```
sinfo = input()
sinfo = open(sinfo).readlines()
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    if park_name[0] == '#':
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    if sinfo[i][1] in fauna and
       park_name in parks:
            parks[park_name][1][1] += 1
    elif …
```

This version is more readable

```
sinfo = input()
sfile = open(sinfo)
for line in sfile:
    sinfo = line.split(',')
    park_name = sinfo[0]
    if park_name[0] == '#':
        continue

    if sinfo[1] in fauna and
       park_name in parks:
            parks[park_name][1][1] += 1
    elif …
```

Summary

- Use constants to make code more readable
  - lists, dictionaries, etc. can also be constants
- Clean up repetition in code after it's written
  - avoids embarrassment when showing code to class
- When operating on complex data structures:
  - use meaningful names for intermediate results to make the code easier to understand