PLT Project

SIP(Simplified Image Processing)
A Language for image processing

Why SIP ??

- Effectively an image processing language.
- Concept can be extended for videos
- Features included to make operations on images short and effective
- Attributes of images : Pixels

Images – basically a 2D array of pixels.

- Action on images implies action on each pixel.

What SIP can do?

- Basic data types – int, float, string, bool, pixels and images.
- Pixel – A four element tuple.
- Basic calculations : Boolean operations, Arithmetic operations, string operations, Pixel operations.
- Basic control flow : if statements, do.. while statements, while .. statements, break.. continue statements, for loops.

Operators

- Arithmetic operators
- '+' operator to add floating point numbers, integers and pixels.

a + b returns the sum of a and b// or individual color components for a pixel

- '-' operator used to subtract integers, floating point numbers or pixels.

a - b returns the difference of a and b/ or individual color components for a pixel

- '/' operator to divide floating point numbers and integers

a / b returns the quotient of a and b.

- '*' operator to multiply integers and floating point numbers.
- a * b returns the product of a and b.

Operators

- '%' operator to return the remainder (or the modulus operator). Here, a % b returns the remainder obtained when a is divided by b.

- Boolean operators :

A + B returns the result of the logical OR

A * B returns the result of the logical AND

! / - A will return the complement of A

Usage

- Environment :

-Ocaml

-gcc

-cImg(used only for displaying images)

- Steps

- make clean

- make

./svipc input.svip

Tutorial for SIP – Demo 1

Sample Code for cropping

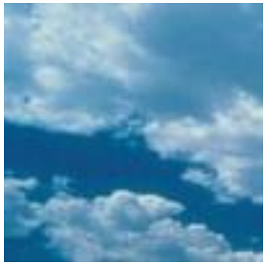
```
string s = input("Enter the path to the image file: ");
display("The path you entered is: ",s);
image i1 = open(s);

image crop(image i,int a,int b)
{
 image df[a][b];
 for(int k = 0; k < b; k+=1)
  for(int j = 0; j < a; j+=1)
    df[k][j] =  i[k][j];
  return df;
}

s = input("Enter the path for the output image file: ");
display("The path you entered is: ",s);
save(crop(i1,100,100),s);
input();
```

Tutorial for SIP – Demo 1 Results

Cropping



Tutorial for SIP – Demo 2

Sample code for Image edge detection

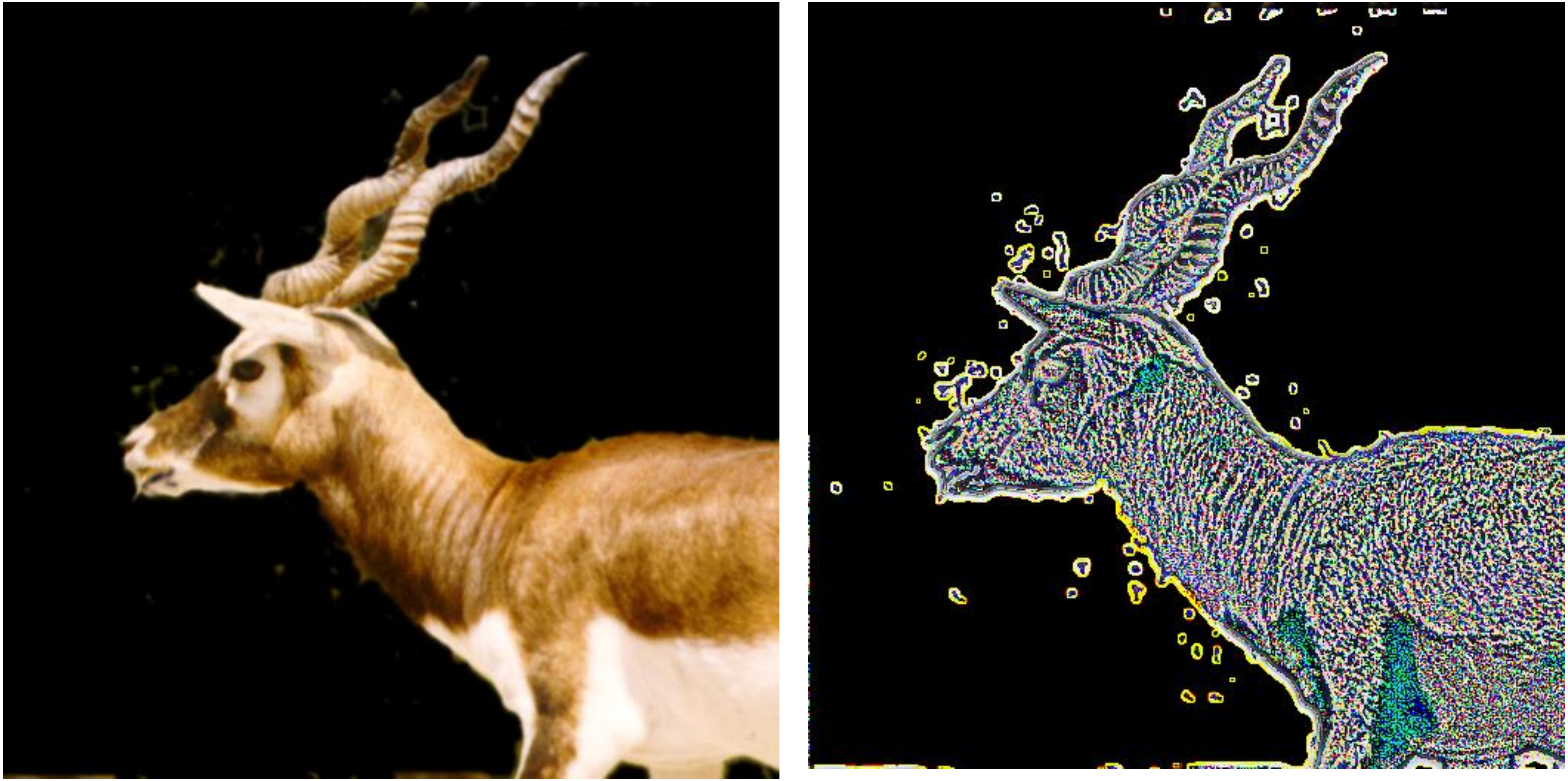
```
string s = input("Enter the path to the image file: ");
display("The path you entered is: ",s);

int a[9] = [-1,-1,-1, -1,8,-1, -1,-1,-1];
image from = open(s);
image to = open(s);

int pos;
int sum1,sum2,sum3;
for(int k = 0;k < from.height - 3; k+=1)
{
for(int l = 0; l< from.width - 3; l+=1)
{
sum1 = sum2 = sum3 = 0;
for( int i = 0; i < 3; i+=1){
 for(int j = 0; j < 3; j+=1)
 { pos = (3 * i) + j;  sum1 += from[(i + k)][(j+l)].C1 * a[pos]; sum2 += from[(i + k)][(j+l)].C2 * a[pos];
  sum3 += from[(i + k)][(j+l)].C3 * a[pos];
 }
 }
```

Tutorial for SIP – Demo 2 Results

Edge detection



Project Architecture

SIP source code → Scanner → Parser →

Semantic analysis → C++ code generation →

Intermediate C++ code → C++ compiler →

Executable file

Summary

- **First and foremost – DO NOT** use Windows for compiler development ...
- Design early !
- Get everyone involved early.
- Digital VLSI doesn't go well with PLT.