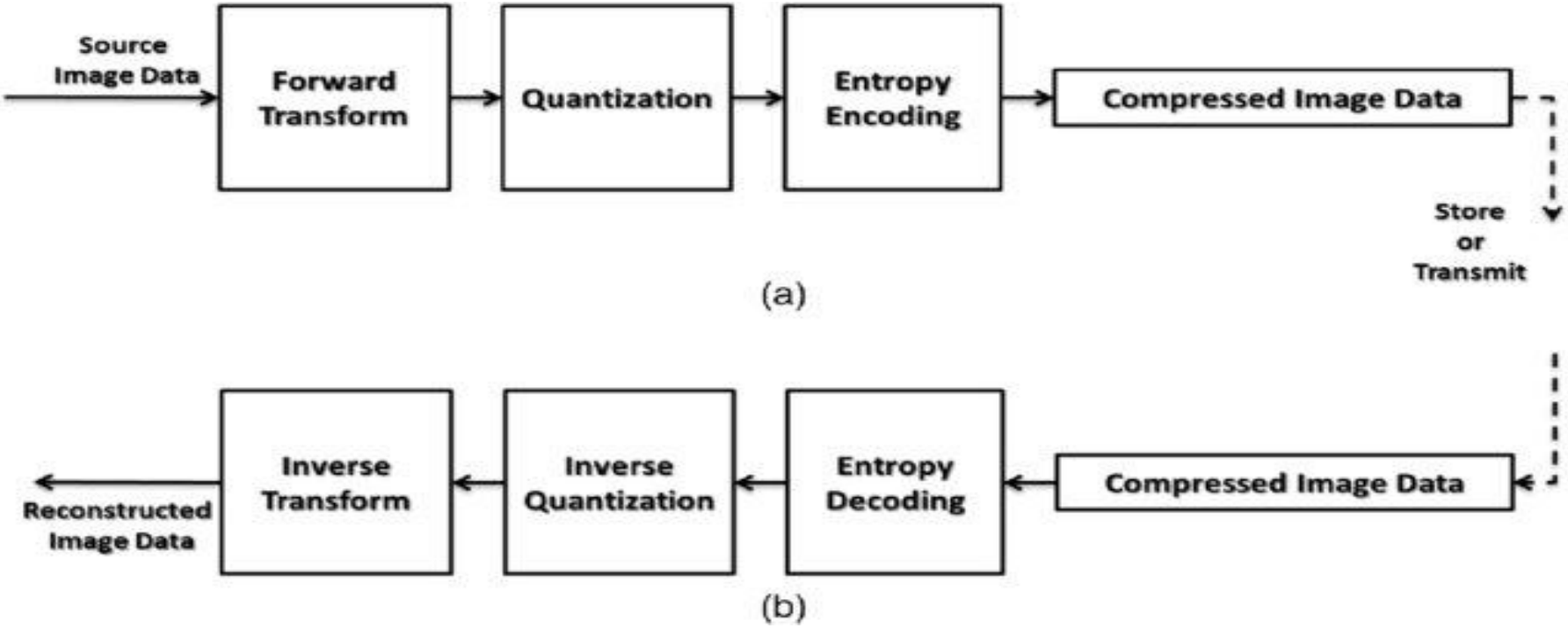
# EE 123 Final Project

By: Henry Leou, Sheng-Yu Wang,
James Park, Johnny Wang

# Workflow - JPEG2000



# What we've tried - JPEG2000

- Residuals (frame differences)
- Transformation:
  - RGB -> YCrCb
  - Downsample / Upsample using FFT
  - Wavelet w/ DB-4
- Quantization w/ Threshold
- LZMA compression
- Video post processing - Bilateral filtering
- Tried utilizing the digipeater field in order to store more information
  - Modify the AX 25 protocol

# What we've found

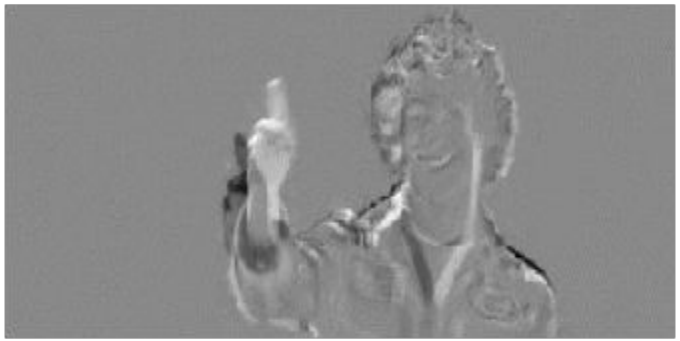
# Downsampling v.s. Quantization

Result on Andy

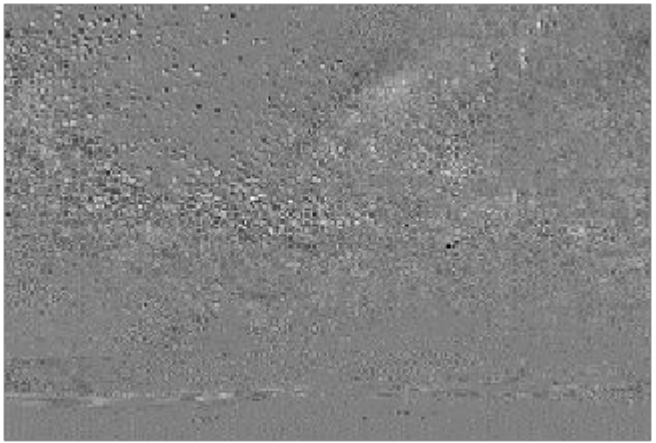
| Downsampling (same for all channels) | Quantization (same for all channels) | LZMA Compression Ratio (Y/Cr/Cb) | PSNR |
|---|---|---|---|
| 1 | 16 | 96 / 395 / 488 | 26.427 |
| 0.85 | 16 | 84 / 361 / 439 | 25.887 |
| 0.7 | 16 | 75 / 316 / 378 | 24.923 |
| 0.4 | 16 | 51 / 194 / 228 | 22.68 |
| 0.1 | 16 | 27 / 44 / 46 | 19.29 |

# Residuals or not?

Difference image - sparsity for free



Andy



Milky way

# Residuals or not?

Disadvantage : error propagates when adding back the residuals

# Bilateral filter

PSNR: 23.65

PSNR: 24.04

# Bilateral filter

PSNR: 28.87

PSNR: 29.32

# Digipeater

- Reduce overhead by sending information in digipeater as well.
- Observed 0.9 transmission time reduction if sent 56 bytes in digipeater.
- Useless bytes: 1+7+7+1+1+2+1 + digipeater = 20+ bytes per packet

| flag | Dest. Addr. | Src. Addr. | Digipeter Addresses | Control field | ID | Information Field | FCS | Flag |
|---|---|---|---|---|---|---|---|---|
| 1 | 7 | 7 | 56 | 1 | 1 | 256 | 2 | 1 |

# Digipeater

```
pi@raspberrypi:~/EE123/ee123_henryleou$ diff yee.txt testingtrans.txt
19c19
<         self.editted_total = [i for i in self.total_coordinates]
---
>         self.editted_total = [i for i in self.total_coordinates]
31c31
<         return self.editted_green
---
>         return self.editted_green
43c43
<         elif color == 'green':
---
>         elif color == 'green':
51c51
<             print(self.editted_yellow)
---
>             print(self.editted_yellow)
67,68c67,68
<             print("distance " one_norm)
<             if one_norm < 15:
---
>             print("distance ", one_norm)
>             if one_norm < 15:
77c77
<             remove_coordinate = self.find_closest_in_editted(coordinate, self.editted_red)
---
>             remove_coordinate = self.find_closest_in_editted(coordinate, self.editted_red)
83c83
<             remove_coordinate = self.find_closest_in_editted(coordinate, self.editted_green)
---
>             remove_coordinate = self.find_closest_in_editted(coordinate, self.editted_green)
89c89
<             remove_coordinate = self.find_closest_in_editted(coordinate, self.editted_yellow)
---
>             remove_coordinate = self.find_closest_in_editted(coordinate, self.editted_yellow)
pi@raspberrypi:~/EE123/ee123_henryleou$
```

# Best results

File Size: 6.1KB;
PSNR: 24.04  (Baseline: 19.57)

Ground Truth

Ours

BaseLine

# Best results

File Size: 6.5KB
PSNR: 29.33  (Baseline: 26.85)

Ground Truth

Ours

BaseLine

# Best results

File Size: 6.6KB
PSNR: 25.89  (Baseline: 22.37)

Ground Truth

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# Best results

File Size: 6.4 KB
PSNR: 18.26  (Baseline: 17.36)

Ground Truth

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# Contribution

We’ve contributed equally.

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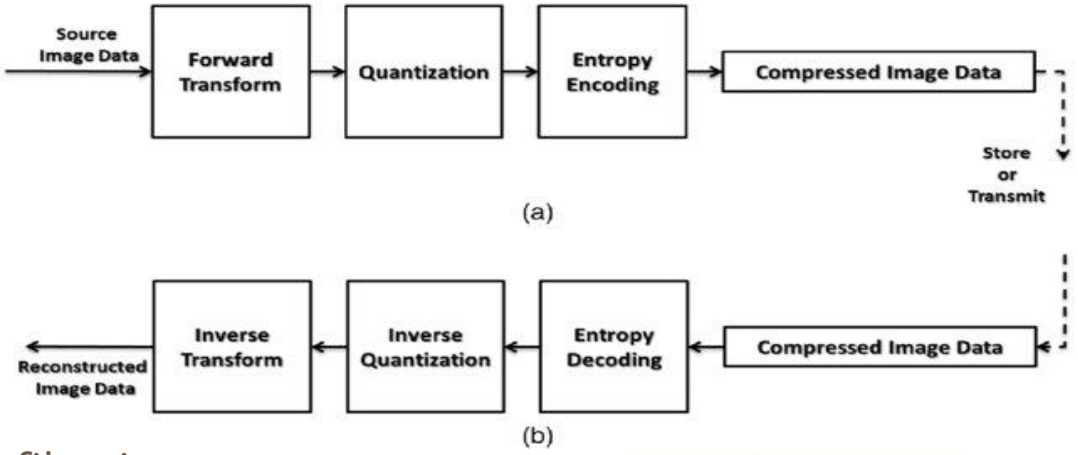


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