



F8.10 Project: send a picture

Data representation · GCSE · about 25 min

Name _____

Class _____

Date _____

What this lesson is about

Capture a camera frame, make it 1-bit, compress it with RLE and send it by radio.

- The brief
- Step 1: capture and convert
- Step 2: compress it
- Step 3: decode and check
- Step 4: send it

Questions

4 marks in all

1. A 32×24 image at 1 bit per pixel. How many bits uncompressed? [1 mark]

2. Why are the RLE rows joined with `/`? [1 mark]
 - ☐ A So the receiver knows where each row ends
 - ☐ B To make the message shorter
 - ☐ C Because RLE requires it
 - ☐ D To encrypt the picture
3. How does the program prove the compression was lossless? [1 mark]
 - ☐ A It decodes the message and checks the rows equal the original picture
 - ☐ B It checks the message is under 200 characters
 - ☐ C It counts the # characters
 - ☐ D It sends the message twice
4. Why does a busier picture make a longer message? [1 mark]
 - ☐ A It has shorter runs, so RLE saves less
 - ☐ B It has more pixels
 - ☐ C Busy pictures use more colours in 1-bit
 - ☐ D The radio slows down

The task: send a picture

Build the program from the brief. Print the 24 picture lines, then `uncompressed: 768 bits` (calculated), `compressed: <n> characters`, and `lossless: True`. Send the message if it has 200 characters or fewer.

```
# the two lines every program starts with: the commands, then the robot
from bugbot import *
connect()

img = camera_image(32, 24)
```

Plan your program here, then type it in and press Run.



Do it on the robot

www.bugbotlab.com/learn/f8-10-project-send-a-picture/

The simulator checks it and tells you when it passes. Nothing to install, no account.

Challenges

1. Compress the whole picture as one string instead of row by row. Which is shorter, and why?
2. Send a 64×48 picture by splitting its message into several messages of 200 characters each, numbered so they can be put back in order.
3. Invent a way to make the message shorter still, for example by writing a row that repeats the one above it as `=`.