COMPLEXITY AND THE BIG-O NOTATION

SO YOU'VE WRITTEN SOME CODE

THE NATURAL QUESTION THEN IS...

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HOW PERFORMANT IS YOUR CODE?

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THIS IS A VERY COMMON QUESTION -
IN THE REAL WORLD AS WELL AS IN
INTERVIEWS

THE ANSWER LIES ALONG SEVERAL AXIS

PERFORMANCE IS MEASURED ALONG
RESOURCE CONSUMPTION AND CODE
CONSUMES A VARIETY OF RESOURCES

IMPROVING CODE PERFORMANCE BEYOND A
CERTAIN POINT INVOLVES TRADEOFFS

CONSUMING MORE OF ONE RESOURCE
CAN HELP CONSUME LESS OF
ANOTHER

MEASURES OF PERFORMANCE

MEASURES OF PERFORMANCE

TIME

THE AMOUNT OF PROCESSING OR NUMBER OF OPERATIONS CODE HAS TO PERFORM TO ACCOMPLISH IT'S OBJECTIVE

NETWORK

THE BANDWIDTH CODE USES TO PASS INFORMATION TO CLIENTS OR OTHER MACHINES

SPACE

THIS IS BOTH MEMORY NEEDED BY CODE TO STORE INFORMATION AT RUN-TIME AS WELL AS DISK SPACE NEEDED BY CODE FOR PERSISTENT STORAGE

PERFORMANCE INDICATES
HOW MUCH OF THESE
RESOURCES THE CODE USES

EFFICIENT CODE USES
FEWER RESOURCES
ALONG ALL THESE AXES

CODE CAN ALSO BE MORE
PERFORMANT WHEN IT USES
THE RESOURCES WE HAVE IN
PLENTY RATHER THAN THOSE
WE LACK

NOW THAT WE KNOW WHAT
PERFORMANCE MEANS

WHAT IS COMPLEXITY?

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COMPLEXITY IS A MEASURE OF HOW
RESOURCE REQUIREMENTS CHANGE
AS THE SIZE OF THE PROBLEM GETS LARGER

COMPLEXITY AFFECTS PERFORMANCE

THE HIGHER THE COMPLEXITY
OF A PROBLEM THE LOWER THE
PERFORMANCE

THE EXACT RELATIONSHIP
DEPENDS ON THE ALGORITHM

BUILDING BLOCKS

THE TIME REQUIRED BY CODE TO RUN DEPENDS ON THE BASIC OPERATIONS IT PERFORMS

ARITHMETIC OPERATIONS

READ

ASSIGNMENT

WRITE

TEST

ALL COMPLICATED OPERATIONS IN CODE CAN BE BROKEN DOWN TO THESE BASIC BITS

TO GET A CLEAR UNDERSTANDING OF COMPLEXITY

DO NOT WORRY ABOUT THE EXACT NUMBER OF OPERATIONS

HOW THAT NUMBER CHANGES BASED ON THE INPUT SIZE

THAT IS HOW PERFORMANCE CHANGES BASED ON INPUT SIZE

WE ALSO FOCUS ON THE WORST CASE PERFORMANCE

WHAT IS THE MAXIMUM NUMBER OF BASIC OPERATIONS THAT MIGHT HAVE TO BE PERFORMED BASED ON THE INPUT?

A QUICK SUMMARY OF EVERYTHING SO FAR

CODE USES TIME, SPACE AND NETWORK RESOURCES

THE AMOUNT OF RESOURCE USED DETERMINES CODE'S PERFORMANCE

COMPLEXITY IS A MEASURE OF PERFORMANCE

COMPLEXITY IGNORES ACTUAL OPERATIONS IN CODE AND FOCUSES ON HOW THAT CHANGE BASED ON INPUT SIZE

WE'RE FOCUSING ON TIME COMPLEXITY IN THESE LECTURES WHICH ARE A FUNCTION OF THE ALGORITHM