Analysis of the Generation of Explanations for Self-assessment Exercises on Algorithm Schemes and Data Structures



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INEDA Innovation group

- Improving the students experience and results with a self-assessment tool by including formative feedback
 - Applying Al and Natural Language Processing techniques to automate the generation of feedback as much as possible
 - Analysing the most appropriate kind of feedback for each kind of question

The subject (UNED, Spain, Computer Science):



ALGORITHM

Advanced Data Structures and Algorithmic Schemes

Data Structures: Ways of organizing information to facilitate the development of algorithms or programs.

Algorithmic schemes: Strategies for approaching problems

Self-assessment tool:

Información Ejercicios

jercicios sobre Coste jercicios Teóricos Ejercicios Prácticos Ejercicios sobre Estructuras de Datos Montículos ▼ Grafos Árboles de Recubrimiento Puntos de Articulación Componentes Conexas Listas de Adyacencia Matrices de Adyacencia Recorrido en Anchura Tablas Hash Ejercicios sobre Esquemas Algorítmicos ▼ Esquema Voraz ▼ Algoritmo de Dijkstra Vector especial Algoritmo de Kruskal Algoritmo de Prim Minimización de Tiempo en el Sistema Esquema Divide y Vencerás Algoritmo QuickSort Programación Dinámica Esquema de BackTracking Esquema de Ramificación y Poda

Ejercicios sobre Esquemas Alg

Número total de ejercicios: 108. Correctos: 0 Esta página contiene 7 ejercicios. Correctos: 0 Buscar páginas relacionadas con este concepto

Buscar paginas relacionadas con este ejercicio

 Sea el problema de la devolución de ca con programación dinámica para pagar siguientes respuestas correspondería a cantidades en la fila correspondiente consideran por orden creciente de valor a. Ninguna de las otras opciones. b. 0 1 2 3 4 5 1 2 3 4 5 6 2

c. 0 1 2 3 4 5 6 2 3 4 5 6 7

d. 🖸 0 1 2 3 4 5 6 2 3 4 5 6 3

Buscar páginas relacionadas con este ejercicio

Sea el problema de la mochila en su y

1000

Wrong!

GREEDY STRATEGY DIVIDE AND CONQUER

BACKTRACKING, etc.

Algorithms for important problems:

SEARCHES

SHORTEST PATH between two points, etc.

STACKS

QUEUES

GRAPHS, etc.

 Sea el problema de la devolución de cambio con monedas de valores 1,6 y 10 solucionado con programación dinámica para pagar una cantidad de 12 unidades. Identifica cuál de las siguientes respuestas correspondería al contenido de la tabla de resultados parciales de cantidades en la fila correspondiente a la moneda de valor 6, si dichas monedas se consideran por orden creciente de valores:

a. 0 1 2 3 4 5 1 2 3 4 5 6 2 b. 0 1 2 3 4 5 6 2 3 4 5 6 7 c. 0 1 2 3 4 5 6 2 3 4 5 6 3

d. Ninguna de las otras opciones.

Explanations are required!

Techniques:



BDALG>

<ALG n="PRIM" description= "Prim's algorithm arbitrarily selects a node of the graph as the root of the minimum s added to the tree such that (MST union (u,v)) is also a tree. The algorithm continues until MST contains n-1 edges. N nat either u or v is in MST.">

<SCHEME s = "GR" c="n^2" v="T"</pre>

ne greedy scheme is applied to optimization problems in which the solution can be constructed step by step witho ms that can be solved with this scheme seek to optimize an objective function. </SCHEME>

<SCHEME s = "DC" c="NA" v="F">

ne Divide and Conquer scheme applies the principle of induction on the various samples of the problem; it thus as (the subproblems to compose the solution to the problem. For sufficiently small cases, the scheme provides a nor uction

</SCHE

</SCHEME> <SCHEME = "DP" c="NA"

SCHEME s = "DP" c="NA" v="F">
This technique is characterized by recording partial results that are produced during the resolution of some problem

is reduced by avoiding the repetition of certain calculations </SCHEME>

<SCHEME s = "BA" c="NA" v="F">

his scheme applies to problems where we can only resort to an exhaustive search, traversing the space of all possi I options, thus concluding that the sought solution does not exist. Since this exhaustive search is very costly, it is in terminate the exploration of a path as soon as it is known that such a path cannot reach a solution. </SCHEME>

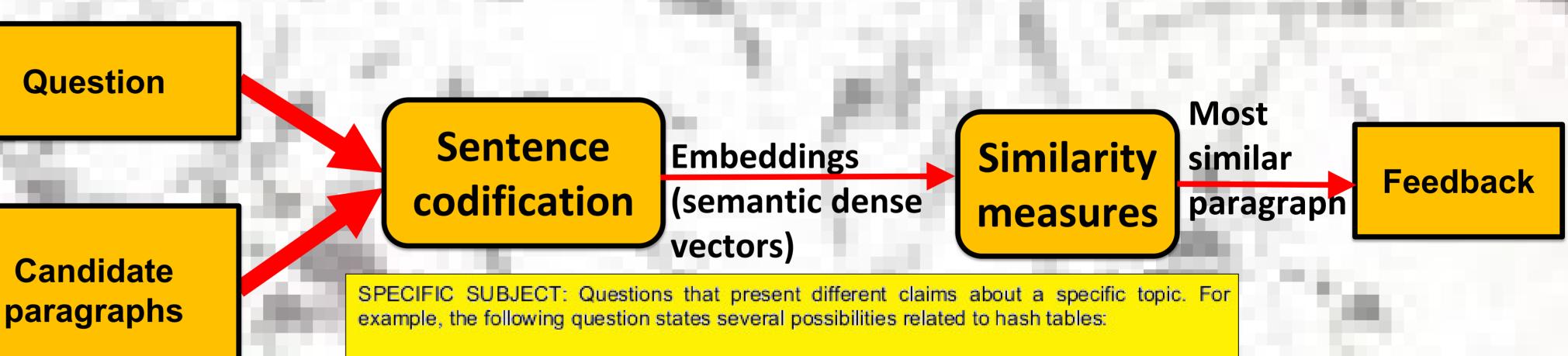
<SCHEME s = "BB" c="NA" v="F"

his scheme is used in those problems in which the objective is the optimization of one or more criteria in the soluti oth can be used to perform the optimization, so its application is indicated only when no valid greedy algorithm is l all possible alternatives to reach a solution are explored, but in this case, in addition to cutting off the exploration of each a solution worse than others are avoided, since the objective is optimization. </SCHEME>

</ALG>

Types of theoretical questions:

- **SPECIFIC SUBJECT:** Different claims about a specific topic.
- SCHEME SELECTION: Questions about the most appropriate algorithmic
- scheme for having less temporal or spatial cost to solve a problem
- COST: Questions about algorithmic cost associated with different data structures



With respect to collision resolution (a) The linear probing allows greate b) If the load factor is 1, it can be so c) Open hashing includes a resoluti d) None of the above is correct. (T) SCHEME SELECTION: Questions about the most appropriate algorithmic scheme for having less temporal or spatial cost to solve a problem. For example, the greedy scheme is the most efficient for solving problems in which the objective is to optimize some parameter. However, it is not always possible to apply it. To solve this type of problems it is necessary to make an analysis of how each algorithmic scheme could be applied to the problem, if it would be correct, and what would be the associated cost. An example of such a question is shown below.



Two pirates intend to share equally the treasure accumulated in their years of pillaging. Each stolen object has a value. As both pirates have their preferences for some objects, before deciding which ones to keep they want to know all the possible ways to divide the treasure in two equal parts. Indicate which of the following schemes would be the most suitable for designing an algorithm to do that task.

a) Greedy algorithm. b) Backtracking.(T) c) Branch and bound.

nithm. COST: Questions about algorithmic cost associated with different data structures or algorithms (T) An example of such a question is shown below.

d Divide and conquer In the graph coloring problem with n nodes using m colors such that no two adjacent vertices

| C | or algorithms. | | | | have the same color, an adjusted upper bound to the cost of finding a solution using a suitable scheme is in the order of: |
|----------|--|---|-------------------------|------------------|---|
| Results: | | | | | a) O(n^2) b) O(n m^n) (T) c) O(m log n) d) O(m ²) |
| 18 | TYPE OF QUESTION | TECHNIQUE | CORRECT FEEDBACK | SIMILARITY(BEST) | |
| 54 | SPECIFIC SUBJECT | SEMANTIC SIMILARITY | \checkmark | 0.7278 | ITEM1: With respect to the resolution of collisions in Hash functions, it can be stated that the linear path allows a greater dispersion of collisions than the quadratic path. SIM: 0.7278948426246643 FEEDBACK PARAGRAPH: Quadratic probing: in the case of the linear probing, the probability of new collisions is quite high for certain key patterns. There is another method based on a quadratic expression |
| ٩ | SCHEME SELECTION | TOPIC TAXONOMY+ SEMANTIC SIMILARITY | \checkmark | 0.6401 | |
| | COST | TOPIC TAXONOMY + SEMANTIC SIMILARITY | ✓ | 0.8520 | based on the function that allows greater dispersion of collisions through the table, while providing a complete traversal of the table. |
| | Conclusions | | | | Future work |
| | Semantic similarity techniques based on transformers automatically select from a book on the subject the most appropriate paragraphs to be presented as feedback for each question. Automatically generated feedback is highly correlated with the self-assessment question considered. | | | | Complete a taxonomy with the feedback corresponding to each self-assessment question. Consider other types of questions such as those of a practical nature. Refine the similarity models. |