Shubhan Engh /2022300118/ Comps B / Batch C Exp 9: Double hashing typedet struct KeyValue & char \* key; char \* value; bool is deleted; KeyValue; typedet struct Hash Table & Key Value \*\* away; float load factor) int num keys; int num occupied indices int num ops KeyValue \* Greatez Keyzvalue (char\* key char \* value) {

KeyValue \* newkeyvalue > malloc (sixof (key value));

( ( ( ) ) ) ( ) ( ) ( ) ( ) ( ) ( ) if Mey Value & NULL) { neurheyvalue -> hay = malloc ((sh len (hey)+1) "size of (chor)); new & heyvalue -> value = malloc ((swien (value)+1) \* size of (chand); stropy (ht manay nowheyvalue -> ney, hey); stropy (newkeyvalue - value, value); new hey value -> is Deleted = false; return neu heyvalue;

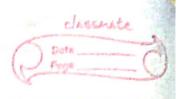
Hash Table \* creak Hash Table () { Hash Table \* new Table = (Hash Table\*) malloc (Gize of (Hash Table) new Table -> array = (Key Value \*\*) malloc (TABLE-SIZE \* fize of (KeyValue +)); for (int i=0; i< TABLE\_SIZE; i++) newtable -> away [i] = NULLi new Table -> size = TABLE\_SEZE; new Table -> load factor = 0; new Table -> num keys = 0; new Table -> num occupied indices = 0; new Table -> num\_ops = 0; return new Table; int key to int (char \* key) { int hash =0, ind=0; while (key [ind] +10') { (key [ind]!=io') { hash t ((int) key [ind] + 128); hash % = TABLE STZE; return hashi int secondhash (int n) ? teturn (11-(n/011));



int insert key value ( Hash Table \* ht, char + key, char + value) if (ht -> num\_occupied - molices == TARLE\_STZE) { int hI = key-to-int (key); int refual: Key Value \* to moent = create Key Value ( key, value); if (ht -> array [h1] == NVLL) { ht -> away [h1] = to mest; ht > num ops ++;
retval = b1; else if (ht - amay [h 1] = - is Deleted == True) { ht -> away [h 1] -> is Deleted = 3 False; stropy ( ht -> amy [h 1] -> key, key); Stropy (ht - amay [h] - value, value); free (ho\_nsert); nt -> num\_ops ++; retral 2 h I; int h2 = second hash (h1) int index = hli while (ht > away [index ]!= NULL) { if (ht -> amony [index] -> is Deleted == True) { ht -> array [index] -> it Deleted = False; stropy (ht - among [index] - hey, key); stripy ( ht -> away [mdex] -> value, value); free (to mert); retral = index; ht > num\_ops ++; goto was deleted;

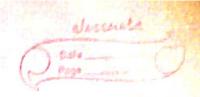


index = += h2; index % = TABLE -SIZE; ht -> num ops ++; 91 (mdcx == h1) { refurn-1) ht - away [index] = to insert i ht > num ops++; was defeted: ht → num keys + +; ht → num-occupied- indices ++ / seturn retral; char \* search\_key (HashTable \* ht, char \* hey) { int h1= key-to-int (key); int ndex 2 h 1 in 9f (ht -> away Cinolex] == NULL) { teturn NULLi else if (strump (ht -> array [mdex] -> hey, hey)==0 22 ht -> array [mdex] -> 13 Deleted == False) { ht -> num\_ops ++ i refurn ht > & array (mdex] -> value; int h 2 = second hash (#1);



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for (int i=0; i < TABLE - SIZE; i++) {
          mdext= h2i
          index % = TABLE_SIZE:
           ht -> num ops ++;
          if (ht -> away [mdex] == NULL) {
           return NULL;
          clse if (ht stramp (ht samay (mda) > hey, key)==0

2 t ht samay [index] - 13 Deletal = 2 false) {
                     ht -> away [mdex] -> value;
          che if (ndex == h1) {
int delete Key ( Hash Table * ht, char * key) {
      int n: ht num-ops;
       char * temp = search hey (ht, key);
        if (temp == NULL)
       int h2 = second hash (malex);
```



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while (stromp (ht -) away [index] - hey, hey) $1:0) {
         ht > num - ops ++i
        index I h2;
index 4 = TABLE_SIZE;
      ht > num ops ++;
      ht & > away [index] -> is Deleted = True;
      ht + num keys --;
      ht > num occupied mdices -- i
   refurn mder;
Float get load factor (Hash table # h+) {

Float If = (float) h+ > num heys / TABLE - STZE;
   ht > load_factor = If;
return If;
Host get average probes (Hash table * ht) {
return ht > num ops / (float) ht - num occupied.
Void display ( Kash Table * ht) {
     printf ("displaying Mash table:\n");
printf ("In index It %-355 \t %-355 \n\n", "KEY",
"VALUE");
     for (mt i=0; i L TABLE_SIZE; i++) {
          if (ht -> away (i) == NULL {

printf ("%-5d \ 1 %-355 \ 1 %-355 \ n ", i,

"NULL" "ALULL"
                                          "NVLL", "NULL");
```

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	1 C ( ) T -> + Odolod = = True) {
7.74	else if (ht - away [i] - 15 Deleted = = True) {
	printf ("%-5d3/+%-35s /+%-35s \n", i,  "defeted", "deleted");
	3
	else {  printf ("%-5d3)+ %-35s \+ %-33s \n", i,
	printt (6-303 [17-2 her ht - amore (i)-realize);
Ť :-	ht samay [i] -> hey, ht -among [i]-realise);
	3 10 (N) NO
	printf ("\n");
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nd.	STATE TO THE TOTAL TOTAL
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