**BAB IV**

**HASIL PENELITIAN**

**4.1 Hasil pengumpulan Data**

Berikut data penelitian yang telah diperoleh dari lokasi penelitian :

**Tabel 4.1** Hasil Pengumpulan Data

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No** | **Nama** | **Penilaian** | | | | | | | | | |
|  |  | **A** | **B** | **C** | **D** | **E** | **F** | **G** | **H** | **I** | **J** |
| 1 | Azalea Khaliqa | 40 | 50 | 55 | 40 | 50 | 50 | 55 | 40 | 55 | 55 |
| 2 | Arsy Nadira Putri | 45 | 50 | 60 | 45 | 50 | 50 | 60 | 45 | 60 | 55 |
| 3 | Kireina S Natadireja | 50 | 50 | 60 | 50 | 50 | 50 | 60 | 50 | 60 | 60 |
| …. | ……. | …. | …. | …. | ……. |  |  |  |  |  |  |
| …. | ……. | …. | …. | …. | ……. |  |  |  |  |  |  |
| …. | ……. | …. | …. | …. | ……. |  |  |  |  |  |  |
| 70 | Akila A.B | 40 | 45 | 50 | 40 | 45 | 45 | 50 | 40 | 50 | 55 |

**4.2 Hasil Pemodelan**

Berikut Tahapan Algoritma *K-Means :*

1. Penentuan pusat awal *Cluster*

2. Perhitungan jarak pusat *Cluster*

Untuk mengukur jarak antara data dengan pusat *cluster* digunakan *Euclidian distance*, kemudian akan didapatkan matrik jarak sebagai berikut :

d(x,y) =

3. Menentukan *Cluster* dengan jarak terdekat pada masing-masing data

4. Menghitung pusat *Cluster* baru

5. Ulangi langkah 3 (Menghitung jarak data yang ada terhadap setiap pusat *Cluster*) 4 (Menentukan *Cluster* dengan jarak terdekat pada masing-masing data) 5 (Menghitung pusat *Cluster* baru) sampai posisi data pada setiap *Cluster* sudah tidak mengalami perubahan.

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**4.3 Penerapan Algoritma K-Means**

**Tabel 4.2** Data Penilaian

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Nama** | **PENILAIAN** | | | | | | | | | |
| **A** | **B** | **C** | **D** | **E** | **F** | **G** | **H** | **I** | **J** |
| Azalea Khaliqa | 40 | 50 | 55 | 40 | 50 | 50 | 55 | 40 | 55 | 55 |
| Arsy Nadira Putri | 45 | 50 | 60 | 45 | 50 | 50 | 60 | 45 | 60 | 55 |
| Kireina S Natadireja | 50 | 50 | 60 | 50 | 50 | 50 | 60 | 50 | 60 | 60 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Langkah-1: Tanyakan pada user, kesembilan data tersebut hendak dibagi kedalam berapa cluster? | | | | | |
|  | Misalkan hendak dibagi kedalam 2 cluster, Jadi K = 2   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | Langkah-2: tetapkan secara sembarang, k=2 rekord diantaranya sebagai *initial cluster centre locations, dan hitung BCVnya*  **Tabel 4.3** Contoh Sampel Data Penilaian   |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  | A | B | C | D | E | F | G | H | I | J | | c1 | 45 | 50 | 60 | 45 | 50 | 50 | 60 | 45 | 60 | 55 | | C2 | 50 | 60 | 50 | 50 | 50 | 60 | 50 | 60 | 60 | 50 | | |   Diketahui rumus :  C1 = |  |  |  |  |

C2 =

*-y2)^2+(x3-y3)^2)*

*-y2)2*

Keterangan

X = Data Lama

Y = Data Baru

Berikut cara kerja perhitungan manual Sbb:

C1 (1). =

=

=

=

= 5

C2 (1). =

=

=

=

= 10

C1 (2). =

=

=

=

= 0

C2 (1). =

=

=

=

= 5

C1 (3). =

=

=

=

= 5

C2 (3). =

=

=

= =

= 0

**4.4. Hasil Pengembangan Sistem**

**1 Diagram Konteks**

* Data Siswa
* Data Centroid

0

Sistem Pengelompokan Kelas Siswa

* Iterasi
* Hasil Cluster

**b**

Kepala Sekolah

**a**

Admin

* Iterasi
* Hasil Cluster

**Gambar 4.1** Diagram Konteks

**2. Diagram Berjenjang**

**Gambar 4.2** Diagram Berjenjang

**3. DAD Level 0**

* Data Siswa
* Data Centroid

Data Siswa

1

Entry Data

Data Centroid

F2

Centroid

Siswa

F1

**a**

admin

**b**

Kepala Sekolah

2

Proses Algoritma K-Means

* Data Siswa
* Data Centroid

Iterasi

F3

Data Iterasi

Data Iterasi

Hasil Cluster

Data Siswa

Siswa

F1

3

Hasil

Hasil Cluster

Data Centroid

Centroid

F2

**Gambar 4.3** DAD Level 0

**4. DAD Level 1 Proses 1**

1.1P

Entry Data

Siswa

Data Siswa

Data Siswa

**a**

Admin

Siswa

F1

1.2P

Entry Data

Centroid

Data Siswa

Data Centroid

Data Centroid

Centroid

F2

**Gambar 4.4** DAD Level 1 Proses 1

1. **DAD Level 1 Proses 2**

**a**

Admin

2

Proses K-Means

Data Siswa

Data Centroid

Iterasi

F3

Iterasi

**Gambar 4.5** DAD Level 1 Proses 2

1. **DAD Level 1 Proses 3**

**a**

Admin

Hasil Cluster

3

Iterasi

Iterasi

F3

Hasil Cluster Kelas Siswa

**Gambar 4.6** DAD Level 1 Proses 3

**4.5 Arsitektur Sistem**

Spesifikasi hardware dan software yang direkomendasikan yaitu :

1. Processor : Intel Celeron atau Lebih
2. RAM : 1 GB atau lebih
3. VGA : 256MB atau lebih
4. Harddisk : 40 GB atau lebih
5. Operating System : Windows 7 atau Windows 10
6. Tools : Notepad ++ atau Dreamwaver

**4.6 Interface Desaign Mekanisme User**

**Tabel 4.2** Interface Desaign

|  |  |  |  |
| --- | --- | --- | --- |
| **USER** | **KATEGORI** | **AKSES INPUT** | **AKSES OUTPUT** |
| Admin | Administrator | All | All |
| Kepala Sekolah | User | Tidak Ada | Hasil *Cluster* |

**4.7 Interface Desaign Mekanisme Navigasi**

**Header**

Navigasi Menu

Navigasi Dokumen / Page / Window

**Gambar 4.7** Mekanisme Navigasi

**4.8 Interface Desaign Mekanisme Input**

**1. Tampilan input Halaman Login**

****

**Gambar 4.9** Desain Login Admin

**2. Tampilan input Data Siswa**

 **Gambar 4.10** Desain input data siswa

**3. Tampilan input Data Centroid**

****

**Gambar 4.10** Desain input Data Centroid

**4.9 Data Desaign**

**1. Struktur Data Admin**

**Tabel 4.3** Data Admin

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Nama : Data Admin  Type : Transaksi  Primary Key : Usernameid  Foreign Key : -  Media : Harddisk  Fungsi : Merupakan Data Pengguna Aplikasi  Struktur Data : | | | | | |
| **No** | **Field** | **Type** | **Size** | **Range** | **Keterangan** |
| 1. | Username | Varchar | 100 | 100 | Username |
| 2. | Password | Varchar | 100 | 100 | Password |
| 3. | Nama Lengkap | Varchar | 100 | 100 | Nama Lengkap |
| 4. | Email | Varchar | 100 | 100 | Email |
| 5. | No Tlp | Varchar | 20 | 20 | No Tlp |
| 6. | Level | Varchar | 20 | 20 | Level |

**2. Struktur Data Siswa**

**Tabel 4.4** Data Objek

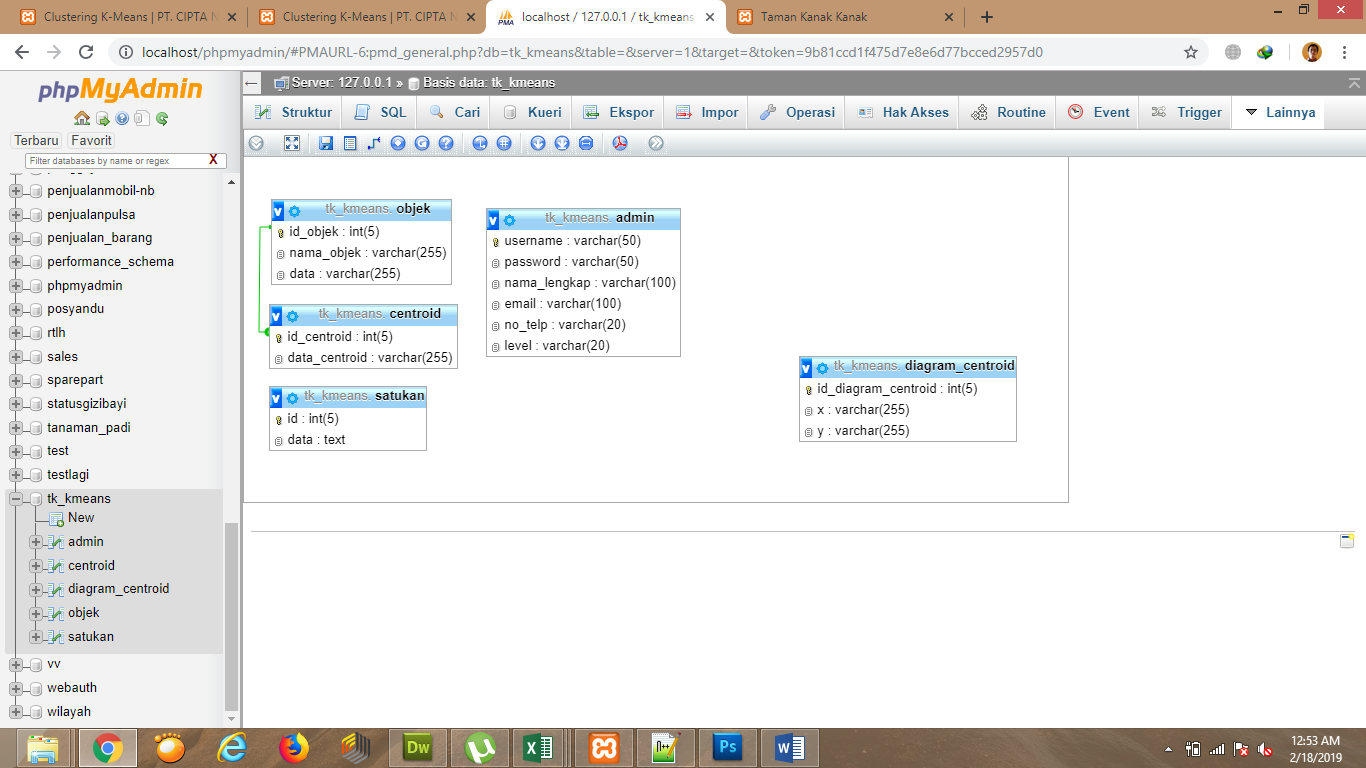
|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Nama : Data Objek  Type : Transaksi  Primary Key : Usernameid  Foreign Key : -  Media : Harddisk  Fungsi : Merupakan Data input penilaian Siswa  Struktur Data : | | | | | |
| **No** | **Field** | **Type** | **Size** | **Range** | **Keterangan** |
| 1. | Id Objek | Int | 5 | 10 | Id Siswa |
| 2. | Nama\_Objek | Varchar | 100 | 100 | Nama Siswa |
| 3. | Data | Varchar | 100 | 100 | Data |

**3. Struktur Data Centroid**

**Tabel 4.5** Data Centroid

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Nama : Data centroid  Type : Transaksi  Primary Key : Id\_Centroid  Foreign Key : -  Media : Harddisk  Fungsi : Merupakan Data centroid  Struktur Data : | | | | | |
| **No** | **Field** | **Type** | **Size** | **Range** | **Keterangan** |
| 1 | Id\_Centroid | Int | 4 | 4 | Id Centroid |
| 2 | Data\_centroid | Varchar | 100 | 100 | Data Centroid |

**4.10 Relasi tabel**



**Gambar 4.11** Relasi Tabel

**4.11 Program Desaign**

**Tabel 4.6** Desain

|  |  |  |
| --- | --- | --- |
| **Class/Type** | **Attributes[Type]** | **Methods[Events/or Type]** |
| Frm menu | AktifDokumen[String] | FrmMain[Load] |
|  | Home[Menu] | frmMain[Closing] |
|  | Logout[Menu] | Home[Click] |
|  | Data Siswa[Menu] | Data Siswa [Menu] |
|  | Add[Toolbar] | Add[Click] |
|  | Delete[Toolbar] | Delete[Click] |
| FrmLogin | Username[TextBox] | FrmMain[Load] |
|  | Password[TextBox] | FrmMain[Closing] |
|  | Ok[Button] | Ok[Click] |
| FrmUser | Username[TextBox] | Username[TextBox] |
|  | Password[TextBox] | Password[TextBox] |
|  | Nama\_Lengkap[TextBox] | Nama\_Lengkap[TextBox] |
|  | E-Mail[TextBox] | E-Mail[TextBox] |
|  | No\_Tlp[TextBox] | No\_Tlp[TextBox] |
|  | Level[TextBox] | Level[TextBox] |

**4.12 Hasil Konstruksi Sistem**

Pada tahap konstruksi sistem, hasil dari analisisdan desain sistem kemudian diterjemahkan kekonstruksi sistem/software dengan menggunakan bahasa pemrograman PHP. Adapun alat bantu yang digunakan pada tahap ini adalah :

1. PHP untuk pemrogramannya
2. Mysql untuk tempat penyimpanan databasenya
3. Dreamwaver untuk tempat editor webnya

**4.13 Kode Program untuk pengujian whitebox**

Private $Objek = array(); 1

Private $Clustercentroid =Null; 1

Private $CekObjekCluster = Null; 1

For ($i = 0;$i<count($obj); $i++) 2

Objek[$i] =New 3

Objek ($obj[Si]); 3

CekObjCluster[$i] = 0; 4

Public Function SetClusterObjek($itr) 5

for ($i=0;$i<count($this->objek[0]->data);$i++) 6

Data ".($i+1)." 7

for ($j=0;$j<count($this->centroidCluster);$j++) 8

Cluster ".($j+1)." 9

for ($i=0;$i<count($this->objek);$i++) 10

Cluster ".($j+1)." 11

for ($j=0;$j<count($this->objek[$i]->data);$j++) 12

".$this->objek[$i]->data[$j]." 13

for ($j=0;$j<count($this->centroidCluster);$j++) 14

objek[$i]->setCluster($this->centroidCluster); 15

if ($j == $this->objek[$i]->getCluster()) 16

Else 17

for ($i=0;$i<count($this->cekObjCluster);$i++) 18

$cek = TRUE; 19

if ($this->cekObjCluster[$i]!=$this->objek[$i]->getCluster() 20

$cek = FALSE; 21

if ((!($cek))&&($itr<20)){ 22

for ($i=0;$i<count($this->cekObjCluster);$i++) 23

$this->cekObjCluster[$i] = $this->objek[$i]->getCluster(); 24

Else 25

for ($i=0;$i<count($this->centroidCluster);$i++) 26

Cluster ".($i+1)." 27

for ($j=0;$j<count($this->centroidCluster[$i]);$j++){ 28

$this->centroidCluster[$i][$j]. 29

for ($i=0;$i<count($this->centroidCluster);$i++) 30

$countObj = 0; 31

if ($this->objek[$j]->getCluster()==$i) 32

$countObj++; 33

for ($k=0;$k<count($this->objek[$j]->data);$k++) 34

$x[$k] += $this->objek[$j]->data[$k]; 35

for ($k=0;$k<count($this->centroidCluster[$i]);$k++) 36

$this->centroidCluster[$i][$k] = $x[$k]/$countObj; 37

if ($countObj>0) 38

else 39

echo "<font color='red'> 40

Terdapat ketidak sesuai Nilai Awal Cluster</font>...............................................40

<br>" 40

**4.14 Flowchart Program untuk Pengujian White Box**





**Gambar 4.11** Flowchart untuk pengujian *white box*

**4.15 *Flowgraph* Program untuk pengujian *WhiteBox***





**Gambar 4.12** *Flowgraph* prosedur sistem *Cluster* Umkm

**4.16 Perhitungan CC pada pengujian *WhiteBox***

Dari Hasil Flowgraph tersebut, didapatkan :

Diketahui :

Region (R)= 17;

Node (N)= 40 ;

Edge (E) = 54 ;

Predicate Node (P)= 16

Rumus : V(G) = (E-N)+2

Atau V(G) = P+1

Penyelesaian :

V (G) = 55 – 40 + 2

= 55 – 40 + 2 = 17

V (G) = P + 1

= 16 + 1

= 17

CC = R1,R2, R3, R4, R5, R6, R7, R8, R9, R10, R11, R12, R13, R14, R15, R16,

R17.

**4.17 *Path* Pada Pengujian *White Box***

**Tabel 4.24** *Path* Pengujian *White Box*

|  |  |  |
| --- | --- | --- |
| **No** | **Path** | **Keterangan** |
| 1 | 1-2-3-2…..40 | OK |
| 2 | 1-2-3-4-5-6-7-6-…….40 | OK |
| 3 | 1-2-3-4-5-6-7-8-9-8…….40 | OK |
| 4 | 1-2-3-4-5-6-7-8-9-10-11-10…....….40 | OK |
| 5 | 1-2-3-4-5-6-7-8-9-10-11-12-13-12…40 | OK |
| 6 | 1-2-3-4-5-6-7-8-9-10-11-12-13-14-15-14…............40 | OK |
| 7 | 1-2-3-4-5-6-7-8-9-10-11-12-13-14-15-16-17-16…...............40 | OK |
| 8 | 1-2-3-4-5-6-7-8-9-10-11-12-13-14-15-16-17-18-19-18…...................….........40 | OK |
| 9 | 1-2-3-4-5-6-7-8-9-10-11-12-13-14-15-16-17-18-19-20-21-20...........................40 | OK |
| 10 | 1-2-3-4-5-6-7-8-9-10-11-12-13-14-15-16-17-18-19-20-21-22-23-24-23...........................40 | OK |
| 11 | 1-2-3-4-5-6-7-8-9-10-11-12-13-14-15-16-17-18-19-20-21-22-23-24-25-26-27-26...........................40 | OK |
| 12 | 1-2-3-4-5-6-7-8-9-10-11-12-13-14-15-16-17-18-19-20-21-22-23-24-25-26-27-26...........................40 | OK |
| 13 | 1-2-3-4-5-6-7-8-9-10-11-12-13-14-15-16-17-18-19-20-21-22-23-24-25-26-27-28-29-30-31-30.............40 | OK |
| 14 | 1-2-3-4-5-6-7-8-9-10-11-12-13-14-15-16-17-18-19-20-21-22-23-24-25-26-27-28-29-30-31-32-33-34-35-34.............40 | OK |
| 15 | 1-2-3-4-5-6-7-8-9-10-11-12-13-14-15-16-17-18-19-20-21-22-23-24-25-26-27-28-29-30-31-32-33-34-35-36-37-36.............40 | OK |
| 16 | 1-2-3-4-5-6-7-8-9-10-11-12-13-14-15-16-17-18-19-20-21-22-23-24-25-26-27-28-29-30-31-32-33-34-35-36-37-38-39-38.............40 | OK |
| 17 | 1-2-3-4-5-6-7-8-9-10-11-12-13-14-15-16-17-18-19-20-21-22-23-24-25-26-27-28-29-30-31-32-33-34-35-36-37-38-39-40 | OK |

**4.18 Hasil Pengujian *BlackBox***

**Tabel 4.8** Pengujian *Black Box*

|  |  |  |  |
| --- | --- | --- | --- |
| **Input/Event** | **Fungsi** | **Hasil** | **HasilUji** |
| Login | Login dengan menginputkan username dan password | * Jika Password Salah, maka ulangi memasukkan username dan password * Jika Password Benar, akan masuk ke sisem | Sesuai |
| Menu Home Admin | Menampilkan Halaman Admin | Halaman Admin ditampilkan | Sesuai |
| Pilih menu data | Menampilkan Halaman tabel input data | Halaman tabel input data ditampilkan | Sesuai |
| Pilih menu Clustering | Menampilkan Halaman Hasil Cluster | Halaman Hasil Cluster Dsitribusi ditampilkan | Sesuai |
| Pilih menu Logout | Kembali ke halaman utama | Halaman utama ditampilkan | Sesuai |