

## DAFTAR ISI

|                                                   |            |
|---------------------------------------------------|------------|
| <b>INTISARI.....</b>                              | <b>v</b>   |
| <b>ABSTRACT .....</b>                             | <b>vi</b>  |
| <b>KATA PENGANTAR.....</b>                        | <b>vii</b> |
| <b>DAFTAR ISI.....</b>                            | <b>vi</b>  |
| <b>DAFTAR GAMBAR.....</b>                         | <b>ix</b>  |
| <b>DAFTAR TABEL .....</b>                         | <b>x</b>   |
| <b>BAB 1 PENDAHULUAN.....</b>                     | <b>1</b>   |
| 1.1. Latar Belakang.....                          | 1          |
| 1.2. Rumusan Masalah.....                         | 4          |
| 1.3. Tujuan Penelitian .....                      | 4          |
| 1.4. Manfaat Penelitian .....                     | 4          |
| <b>BAB II TINJAUAN PUSTAKA .....</b>              | <b>6</b>   |
| 2.1. Sistem Informasi Geografi .....              | 6          |
| 2.2. Interpolasi Air Tanah .....                  | 7          |
| 2.2.1. <i>Inverse Distance Weight (IDW)</i> ..... | 8          |
| 2.2.2. <i>Spline</i> .....                        | 10         |
| 2.2.3. <i>Kriging</i> .....                       | 13         |
| 2.3. RMSE .....                                   | 17         |
| 2.4. Airtanah.....                                | 18         |
| 2.5. Lapisan Akuifer .....                        | 21         |
| 2.6. Siklus Hidrologi.....                        | 22         |
| 2.7. Penelitian Sebelumnya .....                  | 22         |
| <b>BAB III METODE PENELITIAN .....</b>            | <b>17</b>  |
| 3.1. Alat dan Bahan .....                         | 18         |
| 3.1.1. Alat .....                                 | 18         |
| 3.1.2. Bahan .....                                | 18         |
| 3.2. Tahap Persiapan dan Pengumpulan Data .....   | 19         |
| 3.3. Tahap Pengolahan Data.....                   | 21         |

|                                                                                                                |           |
|----------------------------------------------------------------------------------------------------------------|-----------|
| 3.1.3. Pengolahan Interpolasi.....                                                                             | 21        |
| 3.1.4. Uji Akurasi.....                                                                                        | 22        |
| 3.4. Diagram Alir.....                                                                                         | 28        |
| 3.5. Hasil Yang Diharapkan.....                                                                                | 29        |
| 3.6.1. Peta Interpolasi Airtanah metode IDW.....                                                               | 29        |
| 3.6.2. Peta Interpolasi Airtanah metode <i>Kriging</i> .....                                                   | 29        |
| 3.6.3. Peta Interpolasi Airtanah metode <i>Spline</i> .....                                                    | 29        |
| 3.6.4. Perhitungan uji akurasi kedalaman airtanah Metode IDW .....                                             | 29        |
| 3.6.5. Perhitungan uji akurasi kedalaman airtanah Metode <i>Kriging</i> ...                                    | 29        |
| 3.6.6. Perhitungan uji akurasi kedalaman airtanah Metode <i>Spline</i> .....                                   | 30        |
| <b>BAB IV DESKRIPSI WILAYAH .....</b>                                                                          | <b>31</b> |
| 4.1 Administrasi Kota Yogyakarta.....                                                                          | 31        |
| 4.2. Kependudukan Kota Yogyakarta .....                                                                        | 32        |
| 4.3. Sistem Aquifer CAT Sleman - Yogyakarta .....                                                              | 34        |
| <b>BAB V HASIL DAN PEMBAHASAN.....</b>                                                                         | <b>36</b> |
| 5.1. Profil kedalaman Muka Airtanah .....                                                                      | 37        |
| 5.2. Perbandingan nilai histogram dan RMSE.....                                                                | 50        |
| 5.3. Model Interpretasi Yang Paling Tepat Untuk Memodelkan<br>Kedalaman Muka Airtanah di Kota Yogyakarta ..... | 56        |
| <b>BAB VI KESIMPULAN DAN SARAN.....</b>                                                                        | <b>58</b> |
| 6.1. KESIMPULAN.....                                                                                           | 58        |
| 6.2. SARAN .....                                                                                               | 58        |
| <b>DAFTAR PUSTAKA.....</b>                                                                                     | <b>59</b> |
| <b>LAMPIRAN .....</b>                                                                                          | <b>63</b> |
| Lampiran 1. Perhitungan Uji Akurasi RMSE.....                                                                  | 63        |
| 1.1. Interpolasi <i>Inverse Distance Weighted Power</i> = 0.5 .....                                            | 63        |
| 1.2. Interpolasi <i>Inverse Distance Weighted Power</i> = 1 .....                                              | 64        |

|             |                                                                 |     |
|-------------|-----------------------------------------------------------------|-----|
| 1.3.        | Interpolasi <i>Inverse Distance Weighted Power</i> = 2 .....    | 65  |
| 1.4.        | Interpolasi <i>Inverse Distance Weighted Power</i> = 3 .....    | 66  |
| 1.5.        | Interpolasi Metode <i>Kriging Model Gaussian</i> .....          | 67  |
| 1.6.        | Interpolasi Metode <i>Kriging Model Spherical</i> .....         | 68  |
| 1.7.        | Interpolasi Metode <i>Kriging Model Sircular</i> .....          | 69  |
| 1.8.        | Interpolasi Metode <i>Kriging Model Exponential</i> .....       | 70  |
| 1.9.        | Interpolasi Metode <i>Kriging Model Linear</i> .....            | 71  |
| 1.10.       | Interpolasi Metode <i>Spline Regularized Weight</i> = 1 .....   | 72  |
| 1.11.       | Interpolasi Metode <i>Spline Regularized Weight</i> = 0.1 ..... | 73  |
| 1.12.       | Interpolasi Metode <i>Spline Regularized Weight</i> = 0.5 ..... | 74  |
| 1.13.       | Interpolasi Metode <i>Spline Tension Weight</i> = 0 .....       | 75  |
| 1.14.       | Interpolasi Metode <i>Spline Tension Weight</i> = 1 .....       | 76  |
| 1.15.       | Interpolasi Metode <i>Spline Tension Weight</i> = 5 .....       | 77  |
| Lampiran 2. | Langkah Kerja .....                                             | 78  |
| 2.1.        | Penginputan Titik Koordinat .....                               | 78  |
| 2.2.        | Interpolasi .....                                               | 81  |
| 2.3.        | Uji Akurasi RMSE .....                                          | 88  |
| Lampiran 3. | Sumur Gali Interpolasi .....                                    | 91  |
| Lampiran 4. | Sumur Gali Uji Kaurasi .....                                    | 105 |
| Lampiran 5. | Peta Interpolasi Airtanah .....                                 | 111 |
| 5.1.        | Metode <i>Inverse Distance Weighted Power</i> 0.5 .....         | 111 |
| 5.2.        | Metode <i>Inverse Distance Weighted Power</i> 1 .....           | 112 |
| 5.3.        | Metode <i>Inverse Distance Weighted Power</i> 2 .....           | 113 |
| 5.4.        | Metode <i>Inverse Distance Weighted Power</i> 3 .....           | 114 |
| 5.5.        | Metode <i>Kriging Model Exponential</i> .....                   | 115 |
| 5.6.        | Metode <i>Kriging Model Linear</i> .....                        | 116 |

|       |                                                         |     |
|-------|---------------------------------------------------------|-----|
| 5.7.  | Metode Kriging Model <i>Gaussian</i> .....              | 117 |
| 5.8.  | Metode Kriging Model <i>Sircular</i> .....              | 118 |
| 5.9.  | Metode Kriging Model <i>Spherical</i> .....             | 119 |
| 5.10. | Metode Spline Model <i>Regularized Weight 0.1</i> ..... | 120 |
| 5.11. | Metode Spline Model <i>Regularized Weight 0.5</i> ..... | 121 |
| 5.12. | Metode Spline Model <i>Regularized Weight 1</i> .....   | 122 |
| 5.13. | Metode Spline Model <i>Tension Weight 0</i> .....       | 123 |
| 5.14. | Metode Spline Model <i>Tension Weight 1</i> .....       | 124 |
| 5.15. | Metode Spline Model <i>Tension Weight 5</i> .....       | 125 |

## DAFTAR GAMBAR

|             |                                                                                  |    |
|-------------|----------------------------------------------------------------------------------|----|
| Gambar 2. 1 | Komponen dalam SIG .....                                                         | 7  |
| Gambar 2. 2 | Profil lapisan akuifer tertakan dan akuifer bebas .....                          | 21 |
| Gambar 3. 1 | Persebaran sample sumur gali .....                                               | 20 |
| Gambar 3. 2 | Tampilan Nilai Raster <i>Value</i> Metode IDW .....                              | 23 |
| Gambar 4. 1 | Peta administrasi Kota Yogyakarta .....                                          | 32 |
| Gambar 4. 2 | Gambar 4. 2 Pertumbuhan Jumlah Penduduk Kota Yogyakarta<br>Tahun 2013-2019 ..... | 33 |
| Gambar 4. 3 | Peta Cekungan airtanah Yogyakarta-Sleman .....                                   | 35 |
| Gambar 5. 1 | Tampilan Interpolasi IDW dengan <i>Power 0.5</i> .....                           | 38 |
| Gambar 5. 2 | Tampilan Interpolasi IDW dengan <i>Power 1</i> .....                             | 39 |
| Gambar 5. 3 | Tampilan Interpolasi IDW dengan <i>Power 2</i> .....                             | 40 |
| Gambar 5. 4 | Tampilan Interpolasi IDW dengan <i>Power 3</i> .....                             | 41 |
| Gambar 5. 5 | Tampilan Interpolasi <i>Kriging</i> model <i>Spherical</i> .....                 | 42 |
| Gambar 5. 6 | Tampilan Interpolasi <i>Kriging</i> model <i>Sircular</i> .....                  | 43 |
| Gambar 5. 7 | Tampilan Interpolasi <i>Kriging</i> model <i>Linier</i> .....                    | 44 |

|                                                                                                                                                                                                  |    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| Gambar 5. 8 Tampilan Interpolasi <i>Kriging</i> model <i>Exponensial</i> .....                                                                                                                   | 44 |
| Gambar 5. 9 Tampilan Interpolasi <i>Kriging</i> model <i>Gaussian</i> .....                                                                                                                      | 45 |
| Gambar 5. 10 Tampilan Interpolasi <i>Spline</i> model <i>Regularized Power 0.1</i> .....                                                                                                         | 46 |
| Gambar 5. 11 Tampilan Interpolasi <i>Spline</i> model <i>Regularized Power 0.5</i> .....                                                                                                         | 47 |
| Gambar 5. 12 Tampilan Interpolasi <i>Spline</i> model <i>Regularized Power 1</i> .....                                                                                                           | 47 |
| Gambar 5. 13 Tampilan Interpolasi <i>Spline</i> model <i>Tension Power 0</i> .....                                                                                                               | 49 |
| Gambar 5. 14 Tampilan Interpolasi <i>Spline</i> model <i>Tension Power 1</i> .....                                                                                                               | 49 |
| Gambar 5. 15 Tampilan Interpolasi <i>Spline</i> model <i>Tension Power 5</i> .....                                                                                                               | 50 |
| Gambar 5. 16 Perbandingan Histogram Interpolasi IDW <i>Power 0.5</i> (a), IDW<br><i>Power 1</i> (c), IDW <i>Power 2</i> (c), dan IDW <i>Power 3</i> (d).....                                     | 52 |
| Gambar 5. 17 Perbandingan Histogram Interpolasi <i>Kriging</i> model: <i>Spherical</i> (a),<br><i>Sircular</i> (c), <i>Exponential</i> (c), dan <i>Gaussian</i> (d), dan <i>Linear</i> (e) ..... | 53 |
| Gambar 5. 18 Perbandingan Histogram Interpolasi <i>Spline</i> model <i>Tension Power</i> : a<br>(0), b (1), dan c (5).....                                                                       | 55 |
| Gambar 5. 19 Perbandingan Histogram Interpolasi <i>Spline</i> model <i>Regularized</i><br><i>Power</i> : a (0.1), b (0.5), dan c (1) .....                                                       | 55 |

## DAFTAR TABEL

|                                                                                                                         |    |
|-------------------------------------------------------------------------------------------------------------------------|----|
| Tabel 2. 1 Penelitian sebelumnya .....                                                                                  | 15 |
| Tabel 3. 1 Tabel Alat Yang Digunakan .....                                                                              | 18 |
| Tabel 3. 2 Tabel Bahan Yang Digunakan .....                                                                             | 19 |
| Tabel 3. 3 Rincian Data Penelitian .....                                                                                | 19 |
| Tabel 3. 4 Contoh Tabel Uji Akurasi.....                                                                                | 24 |
| Tabel 5. 1 Tabel statistic kedalaman muka airtanah metode IDW dengan<br>menggunakan <i>Variable Search Radius</i> ..... | 51 |
| Tabel 5. 2 <i>statistic</i> kedalaman muka airtanah metode <i>Kriging</i> dengan .....                                  | 52 |
| Tabel 5. 3 <i>statistic</i> kedalaman muka airtanah metode <i>Spline</i> dengan .....                                   | 54 |